

# **EXHIBIT 3**

## **Part 2**

at the slow speeds; only leads having specific markings in the telescope are designated. As the instruction progresses, the target speed is increased and varied. To be proficient, the gunner should be able to track and simulate fire on a target moving at a speed representing 30 miles per hour.

**f. Second exercise.** (1) *Purpose.* The purpose of this exercise is to develop skill in tracking and simulating fire on a target moving over rough ground.

(2) *Procedure.* The exercise is conducted on the hilly course of the 1,000-inch moving target range. The procedure is the same as that described in d above. A change in the sight picture is necessary if the gunner is applying leads to a target moving up or down a hill. (See fig. 23.)

**g. Third exercise.** (1) *Purpose.* This exercise is a modification of the two preceding exercises. Its purpose is to develop the gunner's skill in tracking and simulating fire on successive targets; it represents a situation where the gunner must engage several tanks in rapid succession.

(2) *Procedure.* Either of the courses of the 1,000-inch moving-target range may be used. The sled is equipped with a multiple tank target. The commands for conducting the exercise are modified to indicate which aiming silhouette the gunner is to engage initially, thus: LEFT FRONT, CENTER TANK SEVEN (FOUR) HUNDRED, ONE LEAD, TRACK or COMMENCE FIRING, if firing is to be simulated. When the target appears, the gunner engages the center tank. During the progress of the target over the course, the command to change aiming silhouettes is given thus: TOP RIGHT TANK, or LOWER LEFT TANK. At this command, the gunner ceases tracking the center tank and engages the newly designated tank. Initially, only one or two changes in aiming are ordered during a run of the target; as the men develop skill in manipulation, at least five changes should be made. Changes in speed of the

target and in lead may be made. The gunner's work should be observed carefully and critiqued by the assistant instructor.

## Section VIII. AMMUNITION

**72. GENERAL.** (See TM 9-303). Instruction in ammunition should include the following:

- a. Classification.
- b. Identification and marking.
- c. Mark or model number.
- d. Lot number.
- e. Care, handling, and preservation.
- f. Authorized rounds.

**73. FIRING TABLES.** Firing tables for 57-mm ammunition are issued with each gun. See FM 21-6 for listing of firing tables and information on additional distribution. The following firing tables are printed for use in instruction:

FIRING TABLES FOR 57-MM GUN M1

Projectile A.P.C., M86 Fuze B.D., M72 MV = 2700 f/s			Shot, A.P., M70 MV = 2950 f/s	
Range	Elevation	Change in elevation for 100 yd. change in range	Elevation	Change in elevation for 100 yd. change in range
yd.	mils	mils	mils	mils
0	3.3	.7	3.4	0.6
100	4.0	.7	4.0	0.6
200	4.7	.7	4.6	0.6
300	5.4	.7	5.2	0.6
400	6.1	.7	5.8	0.6
500	6.8	.8	6.4	0.6
600	7.6	.8	7.1	0.7
700	8.4	.8	7.9	0.8
800	9.1	.8	8.8	0.9
900	9.9	.8	9.7	0.9
1,000	10.7	.8	10.6	0.9
1,100	11.6	.8	11.5	0.9
1,200	12.4	.9	12.5	1.0
1,300	13.3	.9	13.6	1.1
1,400	14.2	.9	14.7	1.1
1,500	15.1	.9	15.9	1.2
1,600	16.0	.9	17.1	1.2
1,700	17.0	1.0	18.4	1.3
1,800	18.0	1.0	19.8	1.4
1,900	19.0	1.0	21.3	1.5
2,000	20.0	1.0	22.9	1.6
2,100	21.0	1.1	24.6	1.7
2,200	22.1	1.1	26.4	1.8
2,300	23.2	1.1	28.3	1.9
2,400	24.3	1.1	30.3	2.1

FIRING TABLES FOR 57-MM GUN M1 (Cont.)

Projectile A.P.C., M86 Fuze B.D., M72 MV = 2700 f/s			Shot, A.P., M70 MV = 2950 f/s	
Range	Elevation	Change in elevation for 100 yd. change in range	Elevation	Change in elevation for 100 yd. change in range
yd.	mils	mils	mils	mils
2,500	25.5	1.2	32.5	2.2
2,600	26.7	1.2	34.7	2.3
2,700	27.9	1.2	37.1	2.4
2,800	29.2	1.3	39.6	2.6
2,900	30.5	1.3	42.3	2.7
3,000	31.8	1.3	45.1	2.8
3,100	33.1	1.3	48.0	3.0
3,200	34.5	1.4	51.1	3.2
3,300	35.9	1.4	54.4	3.3
3,400	37.4	1.5	57.8	3.4
3,500	38.9	1.5	61.3	3.5
3,600	40.5	1.6	64.9	3.7
3,700	42.1	1.6	68.7	3.8
3,800	43.8	1.7	72.6	4.0
3,900	45.5	1.7	76.7	4.1
4,000	47.2	1.7	80.9	4.2
6,955			266.7	
9,275			800.0	
9,840	266.7			
13,555	800.0			

## Section IX. FIRE ORDERS

**74. GENERAL. a. Types.** Fire orders are of two kinds: initial fire orders, those issued to get the first shot on the way; and subsequent fire orders, those issued to adjust or shift fire.

**b. Elements of initial fire orders in their proper sequence are:**

(1) Ammunition (included only when necessary to specify the type to be used).

(2) Direction.

(3) Description.

(4) Range.

(5) Lead.

(6) Fire control, which includes —

(a) Number of rounds to be fired (only when restriction on number of rounds is necessary).

(b) Time to open fire.

(c) Time to cease fire.

**c. Elements of subsequent fire orders are:**

(1) Correction in range.

(2) Correction in deflection or lead.

(3) To shift fire from one target to another; change only those elements necessary to bring effective fire on the new target.

**75. COMMANDS FOR INITIAL FIRE ORDERS.** It is essential that the commands used convey the squad leader's orders to the gunner and crew with clarity, completeness, and brevity. The use of standard commands eliminates misunderstanding.

**a. Ammunition.** Ammunition is mentioned in the fire order only when a type other than armor piercing is used.

**b. Direction.** (1) Direction is usually indicated by the commands: FRONT; RIGHT (LEFT) FRONT; RIGHT (LEFT) FLANK.

(2) Direction may be indicated by reference to previously established terrain points such as those on the

range card. Examples of such commands would be: RED BARN; LONE TREE; ROAD FORK.

**c. Description.** The description should be very brief and informal. *Examples:* TANK, COMBAT CAR, ARMORED CAR, SCOUT CAR; TANK APPROACHING FROM CLUMP OF BUSHES; TANKS COMING OUT OF WOODS, THIRD FROM RIGHT; LEADING TANK, PILL BOX, MACHINE GUN.

**d. Range.** The range is announced in even hundreds of yards, SIX HUNDRED; EIGHT HUNDRED; ONE THOUSAND; ONE ONE HUNDRED.

**e. Lead.** Leads are announced for all targets thus: ZERO LEAD, ONE LEAD.

**f. Fire control.** (1) *Number of rounds.* When the squad leader desires to restrict the number of rounds fired, this command is announced in the fire order as: FIVE ROUNDS, THREE ROUNDS. After the five (three) rounds are fired, the gunner ceases firing and the loader announces, "Five (three) rounds complete."

(2) *Time to open fire.* The command COMMENCE FIRING will be given by the squad leader when he desires to open fire. To prepare the gun for instant firing but delay opening fire until an opportune time arrives, the command, UPON COMMAND, is given. When the time comes for opening fire, the command COMMENCE FIRING is given. *Example:* RIGHT FRONT, TANKS MOVING UP ROAD, LEADING TANK, ONE TWO HUNDRED, ONE LEAD, UPON COMMAND. The gunner tracks but does not fire on the leading tank. At the desired instant, the squad leader gives the command: COMMENCE FIRING. The platoon leader may employ this method of controlling the time of opening fire, using such control phrases as UPON SIGNAL, or ON THAT RIDGE LINE. The squad leader issues his fire order and controls the time of opening fire accordingly.

(3) *Time to cease or suspend firing.* Fire may be stopped by the command: CEASE FIRING. The

platoon leader may control the time of arresting fire by such phrases as UPON SIGNAL, or ON THAT RIDGE LINE; CEASE FIRING; the squad leader controls the fire of his gun accordingly.

#### 76. COMMANDS FOR SUBSEQUENT FIRE ORDERS. a.

**General.** The commands prescribed below will be used in ordering corrections in range and deflection.

**b. Corrections in range.** The commands used for ordering range changes are: HIGHER, (LOWER), followed by the amount of range change in yards. *Example:* HIGHER, FOUR HUNDRED.

**c. Corrections in deflection.** The commands used for ordering deflection changes are:

(1) *Moving targets.* ONE LEAD MORE; TWO LEADS LESS.

(2) *Stationary targets.* RIGHT ONE LEAD; LEFT TWO LEADS.

**d. Hit.** Correct range and deflection adjustment is announced by the command HIT.

**e. Shifting fire.** The shifting of fire from one target to another does not require a new initial fire order, but requires only the changing of those elements of the initial fire order which would be incorrect if applied to the new target. The commands used are those already specified for initial and subsequent fire orders.

#### 77. EXAMPLES OF INITIAL AND SUBSEQUENT FIRE ORDERS.

Since examples to fit all situations are impracticable, the examples on page 81 should be considered as guides:

#### Section X. RANGE, SPEED, AND LEAD DETERMINATION

**78. GENERAL.** Accuracy in determining the range to a target, its speed and, ultimately, the lead necessary for the application of effective fire must be acquired by each member of the squad. Each squad member

Initial fire order	Subsequent fire orders			
	1.	2.	3.	4.
	1. RIGHT FRONT PILLBOX AT EDGE OF WOODS EIGHT HUNDRED ZERO LEAD COMMENCE FIRING	LOWER, FOUR HUNDRED	RIGHT, ONE LEAD	HIT CEASE FIRING
	2. FRONT LEADING TANK EIGHT HUNDRED ONE LEAD COMMENCE FIRING	NEXT TANK ON RIGHT TWO LEADS	HIGHER FOUR HUNDRED	HIT CEASE FIRING
3. RED BARN TANK SEVEN HUNDRED ZERO LEAD COMMENCE FIRING	ONE LEAD MORE	HIT	LOWER TWO HUNDRED ONE LEAD LESS	HIT



should be trained first to determine the range to any target, stationary or moving. Then he should be trained to determine the speed of a target moving at any range and in any direction, thus preparing him for application of the lead table.

**79. RANGE DETERMINATION. a. General.** The most efficient method available to determine the initial range to the target is used. At times ranges may be secured by pacing, measurement by vehicle speedometer, range finders, intersection methods, or by firing. The method usually used is estimation by eye.

**b. Estimation by eye (1) Necessity for training.** Since estimation by eye must be depended upon in combat, each man should be trained in this method. Emphasis should be placed on estimating ranges between 200 and 1,500 yards. Estimations by eye of untrained men are little better than guesses and the average errors of such men will be at least 15 percent of the range. A definite system of range estimation, frequently practiced, is the only way to make estimation by eye sufficiently reliable.

(2) *Application.* (a) Estimation by eye consists of measuring the range by applying to it a unit of measure 100 yards long. This is accomplished by the use of an accurate mental picture of one 100-yard length which the man applies to the distance to the target. When applying the unit of measure beyond 500 yards, it is better to select a point halfway to the target, apply the 100-yard unit up to this halfway point, and multiply the estimated distance by two.

(b) Another very practical method for range estimation is to have the individual develop an accurate mental picture of the apparent size, distinctness, and factors of appearance of tanks and other objects at certain key ranges. The average of a number of estimates by different men will be more accurate than a single estimate.

**80. SPEED DETERMINATION. a. General.** Constant practice in estimating speeds of vehicles is the only method by which the squad can acquire accuracy in speed estimation. Training must include the use of vehicles moving at various ranges, speeds and directions.

**b. Method of instruction.** The squad will be given a demonstration followed by a test, in which vehicles move according to a prearranged plan. Initially, the squad will be shown by demonstration the appearance of vehicles moving at announced speeds and ranges. Then each man will be required to estimate speeds of vehicles moving at various ranges and in various directions.

**81. LEAD DETERMINATION. a. General.** The distance by which a target is led is measured from the point of aim and is equal to the distance the target will travel between the time the projectile leaves the gun and its trajectory crosses the path of the target. It is known as lead and will vary with the speed and path of the target.

**b. Unit of measure.** To compensate for the difference in time of flight of the projectile at various ranges, the telescopes with which this gun is equipped provide measurement of angular leads. (See pars. 68b and 70b.)

**c. Lead determination.** (1) The simple lead table below gives the amount of lead necessary to engage a target moving at a right angle to the line of fire. The lead table is a guide in training. It is not expected that it will be used consciously during actual firing because members of antitank gun squads should be drilled so thoroughly in its use that determination of correct leads becomes second nature.

(2) The angle at which the target is moving will alter the amount of lead to be taken; that is, if the angle between the line of fire and the path of the

LEAD TABLE

Target moving at right angle to line of fire (mph)	Leads (for all ranges)	
	Telescope M18	Telescope M69C
Slow (less than 10).....	$\frac{1}{2}$	1
Medium (10 to 20).....	1	2
Fast (over 20).....	$1\frac{1}{2}$	3

target is  $45^\circ$  or less, reduce the lead by one half.

(3) For targets moving directly toward or away from the gun, no lead is taken.

(4) The lead table will furnish the amount of lead to be used for the first round; necessary corrections thereafter should be based upon observation of strike or tracer.

## CHAPTER 4

### TECHNIQUE OF FIRE

#### Section I. GENERAL

**82. DEFINITION AND SCOPE.** Technique of fire with the 57-mm gun M1 is the delivery of effective fire upon a target. It requires thorough knowledge of the gun and ammunition and a high state of proficiency within the squad in preparatory gunnery training. The squad must be able to function with precision, teamwork, and speed before proceeding into this phase of training. Since direct fire only is employed, technique of fire will be considered in relation to two general types of targets, in the following sequence.

a. Stationary and moving targets with considerable vertical profile, such as armored vehicles.

b. Stationary targets with little or no vertical profile, such as tanks in hull defilade, dug-in and concealed antitank guns and machine guns.

**83. OBSERVATION OF FIRE.** Technique of fire consists principally of fire adjustment, requiring close cooperation between the squad leader (observer) and the gunner. The 57-mm gun has a muzzle blast at the mount which blinds the gunner and prevents him from observing the trace or strike of his round. The amount of blinding caused by muzzle blast varies with the nature of the soil, light conditions, and direction and force of the wind. Because of this blinding, it is necessary for the squad leader to observe for the gunner, sense the trace or strike of the round, and adjust the fire. He accomplishes this by stationing

himself outside the limits of the blast wherever possible and adjusting the fire by the commands prescribed in section IX, chapter 3, and the procedure outlined in the sections below.

## Section II. STATIONARY TARGETS WITH VERTICAL PROFILE

**84. GENERAL.** This part of technique of fire includes the initial laying, and the use of trajectory in sensing and subsequent laying on stationary targets with vertical profile. This discussion is restricted to stationary targets although the principles apply to moving targets as well. Moving targets are discussed in section III.

**85. INITIAL LAYING.** The squad leader, having determined the initial data to the target, incorporates these data in a fire order to the gunner. The gunner lays the appropriate aiming point of the telescope reticle on the center of mass of the visible portion of the target. At very short ranges, the point of aim may be shifted to a vulnerable spot on the target (fig. 26) such as a lightly armored point on a tank.

**86. SENSING AND SUBSEQUENT LAYINGS. a. General.** Each member of the squad must be trained to observe in order to understand methods of adjusting fire and must be able to bring effective fire on a target. The adjustment of fire consists of sensing the range and deflection error of the strike or trace of the projectile with relation to the target, and announcing the range and deflection correction necessary to bring the strike on the target. When a round penetrates armor plate, a red flash is produced. When a round strikes masonry, ground, or wood, a pattern of striking fragments surrounds the strike. Sensing the strike on targets of this kind is easy. However, a strike on

targets which give off no visible indication of the strike such as cloth targets used in training is not easy to sense. Sensing in the latter case and in the case of rounds which miss the target depends upon observation of the trace of the projectile at the moment it passes the target.

**b. Use of the trajectory.** The path of the projectile may be considered a rigid curve, pivoted at the gun and capable of being raised or lowered about its pivot by elevating or depressing the gun. The trajectory of the 57-mm projectile is relatively flat, its maximum ordinate for a range of 1,000 yards being 61½ feet. For this reason, a round which passes a target at the correct elevation, but wrong deflection, travels far beyond and to the right or left of the target before it strikes the ground (unless the ground rises sharply in the vicinity of the target.) Figure 24 illustrates the paths of the trajectories of three rounds fired so as to strike the tank at three points in its vertical plane. Each round, if deflection is correct, is a hit on the tank. However, if deflection is not correct, each round passes the tank and strikes the ground somewhere beyond and to the right or left of the tank.

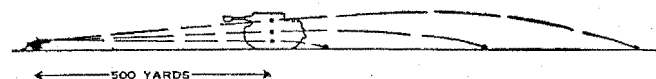


Figure 24. Path of trajectory.

**c. Sensing for range.** Because of the flat trajectory of the projectile, if a round fired is high or low, the squad leader can be practically certain that by making a range change of 400 yards and using the correct deflection, a hit can be secured with the subsequent round. The squad leader should keep his eyes focused on the target and determine by the trace or strike of the projectile whether the round was high or low.

**d. Sensing for deflection.** In sensing for deflection,



the squad leader is guided by the same considerations used in sensing for range. If a round strikes the target, but not at the point of aim, the squad leader senses the deflection error in leads and direction (right or left) it must be moved to hit the desired point on the target. If there is no indication of a strike, the squad leader with his eyes focused on the target senses, in leads, the error of the trace right or left of target center.

**e. Subsequent laying.** (1) Once fire has been opened with the 57-mm gun it is essential that fire be continued and adjustment be made rapidly to destroy or neutralize the target, or shift fire to a new target. In any case, where a new initial fire order is not necessary, fire can be continued, adjusted, or shifted by the commands prescribed for subsequent fire orders in section IX, chapter 3. The resulting subsequent laying is made on the knowledge of the laying used in firing the last round of the preceding fire order and may consist only of correction in one or two elements of the preceding order.

(2) If a round fired at a target is an effective hit the squad leader commands: HIT and the gunner continues firing with the same laying until directed by the squad leader to change targets or cease firing.

(3) If a hit is not effective and must be adjusted to be effective, or if a round fired is a miss, the squad leader orders adjustment by the commands HIGHER (LOWER) FOUR HUNDRED; LEFT (RIGHT) ONE (TWO) LEAD. This adjustment immediately follows the firing of the round. The gunner applies the ordered adjustment to the laying with which the round was fired, making correction if necessary for faults which existed in his last sight picture. The gunner must be trained to call each shot mentally at the moment of firing in order that the correct adjustment will be made. He must know exactly how the gun was laid, for it is on these data that the corrections in range and deflection are made.

(4) (a) If the first round fired on a target is high and a miss, a range change of 400 yards lower is made. If the second round is low, a range change of 200 yards higher is made. Range changes of 100 yards rarely will be made.

(b) If the first round fired is a target hit, but not an effective hit, the squad leader may make an original range change of 200 yards to secure an effective hit.

(5) Deflection corrections, where needed, will be determined by sensing in leads as described above. Movement of the strike of the projectile on a target is shown in the following table:

EFFECT OF ONE-LEAD CHANGE

Ranges (yards)	Movement of strike (feet)	
	Telescope M18	Telescope M69C
500.....	13.3	7.5
1,000.....	26.7	15

The squad leader announces to the gunner, the deflection shift necessary as, "Right one lead; left one-half lead."

### Section III. MOVING TARGETS

**87. GENERAL.** Except for minor changes in the technique of initial laying and subsequent laying, the principles set forth in sections I and II apply generally to moving target firing.

**88. INITIAL LAYING.** The squad leader determines the

initial data to the target and issues a fire order to the gunner. The gunner lays the appropriate aiming point of the telescope reticle on the center of the mass of the visible portion of the target. The gunner traverses smoothly and does not stop tracking when he fires.

**89. SUBSEQUENT LAYING. a. General.** As in stationary target firing, the laying with which the last round was fired will be the basis for every adjustment. The gunner must continue to look through the telescope and track the target as the gun is fired so that he will know the sight picture he used at the instant of firing. The gunner uses this information in subsequent laying as he is given adjustments by the squad leader.

**b. Subsequent fire orders.** Corrections in range in subsequent fire orders for moving targets are identical with those for stationary targets. However, deflection corrections, in terms of leads, are announced as, "One lead more, two leads less."

#### Section IV. TARGETS WITH LITTLE OR NO VERTICAL PROFILE

**90. GENERAL.** The application of fire to targets with little or no vertical profile, or to small fixed targets is governed generally by the same principles used in firing on targets with vertical profile. (See secs. II and III.) Such targets may be tanks in hull or turret defilade, concealed and dug-in antitank and machine guns, or pill boxes.

**91. INITIAL LAYING.** The squad leader, having determined the initial data to the target, incorporates them in a fire order to the gunner. The gunner places the appropriate aiming point of the telescope reticle

in the center of the visible mass of the target exactly as in firing at targets with large vertical profile. If the target is small and obscure and oral designation is difficult, the squad leader lays the gun for the gunner, and issues a complete initial order.

**92. SENSING AND SUBSEQUENT LAYING (fig. 25). a.** Sensing the trace or strike of the projectile and its relation to a target with little or no vertical profile is the same as on a target with vertical profile.

**b. (1)** In general, training in subsequent laying on this type of target follows the same pattern as that outlined in section II. However, adjustment of fire on a target with little or no vertical profile usually involves bracketing. A bracket is obtained on a target when two consecutive rounds fired with different range settings are sensed high and low, respectively, with relation to the target. If the first round fired is sensed high, and the second round, fired with a range change of 400 yards lower, is sensed low, then the target is bracketed within a 400-yard bracket. To bring the next round closer to the target it is fired

#### BRACKETING

##### STATIONARY TARGET WITH LITTLE OR NO VERTICAL PROFILE




COMMANDS	RESULTS	SENSINGS
(1) FRONT PILLBOX EIGHT HUNDRED ZERO LEAD COMMENCE FIRING		(1) LOW
(2) HIGHER FOUR HUNDRED		(2) HIGH
(3) LOWER TWO HUNDRED		(3) HIT

Figure 25. Adjustment of fire.

with a 200-yard change into the center of the bracket. This is known as splitting the bracket. If an effective hit is not obtained with this round the bracket is split again.

(2) Situations may arise when it is possible to make a 200-yard range change to establish a bracket and thus place fire on a target more quickly with a saving of ammunition. A general rule to follow in determining the use of a 200-yard bracket or a 400-yard bracket is:

(a) At short ranges, when it is possible to determine positively that a range change of 200 yards will bracket the target or produce an effective target hit on the second round, use a 200-yard range change.

(b) At long ranges, when sensing of the trace or strike of the projectile is not positive, always use a 400-yard bracket.

(3) Deflection correction is ordered by leads, or half leads, right or left, according to the amount and direction of deflection error sensed. Once the correct deflection is obtained it should not be necessary to make further changes while firing on the same target.

### Section V. NIGHT FIRING

**93. GENERAL.** The principles outlined in sections I to IV, inclusive, apply in general to night firing. However, laying at night must be accomplished by means of the lighted reticle and flares or lights and sensing depends almost entirely on observation of the trace of the projectile.

a. The following method for firing antitank weapons at night has been successfully employed.

(1) Guns are placed in selected positions and sighted. All possible lines of approach or "tank runs" are located and marked down. Mines are laid to cover these approaches.

(2) An "illuminating party," equipped with flares

and projectors, establishes an observation post well forward and to the flank. This party must make a flare reconnaissance to insure that the flares used will not cast shadows on the likely lines of approach and will, wherever possible, light up the background so as to silhouette the target against its background.

(3) As soon as the sound of approaching tanks is heard, the pieces are loaded, elevation set at normal ranges according to knowledge of the approaches, and pieces set at safety. The illuminating party fires flares at 5-second intervals, continuing the firing of flares as the situation requires. The guns then engage the approaching tanks, firing as the flares reveal the position of the targets.

b. Other techniques of employment of flares or lights may prove practicable.

### Section VI. CONDUCT OF FIRE

**94. DEFINITION.** Conduct of fire consists of all operations connected with the preparation and the actual application of effective fire upon targets.

**95. SECTOR OF RESPONSIBILITY.** a. The platoon leader will assign a definite sector of responsibility to the squad leader; the squad leader is responsible for continuous observation of this sector and for taking under fire hostile armored vehicles and other appropriate targets which appear at effective range therein. However, fire is not restricted to the sector of responsibility but will be placed on any appropriate target which constitutes a threat to the flanks or rear when tanks are not operating in the sector of responsibility.

b. The platoon leader also assigns a principal direction of fire for each gun within its sector in order to insure that the most likely avenues of tank approach are covered effectively, and to coordinate the fire

of all guns for the best defense of the unit. The squad leader is responsible for placing the gun in firing positions (primary or alternate) so that it can fire in the assigned *principal direction without shifting the trails.*

c. When sectors of responsibility are assigned, any fire control to be exercised by the platoon leader must be carefully arranged for in advance of the fire fight. During the fire fight, the platoon leader will, as a rule, convey orders to the guns by signal; it is therefore essential that any signals to be employed are understood by all concerned.

**96. OBSERVATION.** Before, during, and after firing, each squad leader is responsible for continuous observation of the battlefield. A system of observation within each gun squad must be established and maintained with every available means. The squad leader may assign various members of his squad to observe for targets. After fire has commenced, these duties must be continued to permit early detection of new targets. In addition to their regular duties, No. 5 may be detailed to observe to the left and left rear and No. 6 to the right and right rear. Individuals in observation must know the mission of the most advanced friendly troops, where they are located, and whether friendly tanks have been or will be employed.

**97. FIRE CONTROL. a. General.** After the gun is placed in the firing position, the squad leader takes a position outside the area of the muzzle blast from which he can control the fire of the gun. He determines the initial data necessary to engage the target, and issues a fire order. He controls each round fired by following the procedure outlined in section I, II, III, and IV.

**b. Selection of targets.** Within his assigned sector, each squad leader is permitted to select his targets. Fire control by platoon leaders is exceptional.

**c. Time to open and cease fire.** (1) The correct time to open fire is very important and at times difficult to determine. Fire may be controlled by the platoon leader; more often, however, the decision is made by the squad leader. Excellent fire discipline on the part of the gun squad is essential. Effective fire depends upon concealment and surprise; to secure maximum effect, fire may be withheld on a moving armored vehicle until there is a reasonable certainty of getting a hit with the opening round. *Normally, with the 57-mm gun, fire will not be opened against tanks at ranges greater than 800 yards.* Often it may be desirable to track the target when it first appears and delay the opening of fire to await a more opportune time. Frequently the enemy will seek by means of ruse or feints to draw fire prematurely and enable hostile observers to locate the gun position. When it is located, enemy supporting weapons will attempt to neutralize it by fire or smoke. If fire is opened too late, the gun crew will not have time to combat the successive moves of tanks. To stop tanks quickly, every effort should be made to engage them so that vulnerable points are brought under fire. The most vulnerable areas are the sides, tracks, traction system mechanisms, and bellies. The turrets and front are the most heavily armored. (See fig. 26.) Therefore, flanking fire is preferred to frontal, and fire should be adjusted so that hits are obtained on the most vulnerable points.

(2) When a tank has been stopped, one more round should be fired into it before another target is engaged. However, no effort should be made to destroy a partially disabled tank as long as a mobile tank is within range, unless the disabled tank is firing upon friendly troops.

**d. Rate of fire.** The rate of fire will be determined by the number, range, and visibility of hostile tanks; and by the varying effect of muzzle blast. At more distant ranges, the rate of fire will be slow due to the



difficulty in accurately tracking the target. At close range, tanks must be fired on with great rapidity to prevent a breakthrough. The ammunition supply may prove the determining factor.

**e. Action when fire mission is completed.** If operating independently, the gun is immediately withdrawn to the cover position after accomplishing its fire mission. If the situation requires or permits, a change of position is made. If operating under fire control of the platoon leader, these moves are made only upon his order.

**98. SHIFTING OF FIRE.** **a.** When a hit is made, the squad leader calls, "Hit." The gunner continues to fire at the target until directed by the squad leader to change target, or cease firing. When tanks are in an attack formation, the leading enemy vehicle within the assigned sector should be engaged first; however, command vehicles should receive priority. Engaging the leading vehicles of an enemy column passing along a road in order to block the road is effective.

**b.** If the situation so requires (for example, when a command vehicle or tank is recognized or a particular tank is approaching dangerously near), the squad leader may order an immediate change of target by calling, for example, "Third from the right."

**c.** If tanks suddenly appear from a new direction and threaten to overrun the firing position, it may be necessary to shift the trails to meet this threat. The command **NEW DIRECTION LEFT (RIGHT) WHITE HOUSE, TANK, THREE HUNDRED, ZERO LEAD**, is given. The gun is swung in the new direction and firing continues.

**99. VULNERABLE PARTS OF A TANK** (fig. 26). Anti-tank gunners must be thoroughly familiar with the military characteristics of all tanks likely to be encountered in their sectors so that they can apply immediate effective fire to the most vulnerable portions

of the tank, when possible. Hits on the traction system (fig. 26 ①) will usually immobilize the tank making it an easy target. Hits at the junction of the turret and hull (fig. 26 ②) will either jam the turret mechanism or blow the turret off the hull. Hits below the fender line (fig. 26 ③), where the side armor plate is thinnest, will penetrate into the crew compartment, kill the crew, and ignite the ammunition in the turret basket. Penetration of the gasoline tanks (fig. 26 ④), will set the tank afire and force the crew to abandon the vehicle. Penetrations can be made at the ventilating points (fig. 26 ⑤). A hit on the vision slits (fig. 26 ⑥) blinds the crew and renders the tank helpless. Top and bottom plates (fig. 26 ⑦) are of the thinnest armor and should be fired on if possible. Points marked X in the figure are of the heaviest armor plate.

**100. AUXILIARY AIMING POINT.** **a. General.** Situations may arise when the use of an auxiliary aiming point is necessary for the delivery of effective fire on a target. For use with the 57-mm gun M1, the aiming post M1, and the aiming post light M14 are provided. Discussed below are suggested methods of firing by sighting on the aiming post.

**b. When the gun is not in position.** (1) The squad leader selects the gun position and marks the approximate position of the telescope by driving a section of the aiming post in the ground directly below the position of the telescope. He then directs No. 1 to take another section of the aiming post and move approximately 100 feet toward the target from the gun position. This distance should be measured as accurately as the situation permits.

(2) Sighting over the aiming post at the gun position, the squad leader aligns the forward post on the line of sight to the target. Marking this alignment, No. 1 moves the aiming post approximately 24 inches

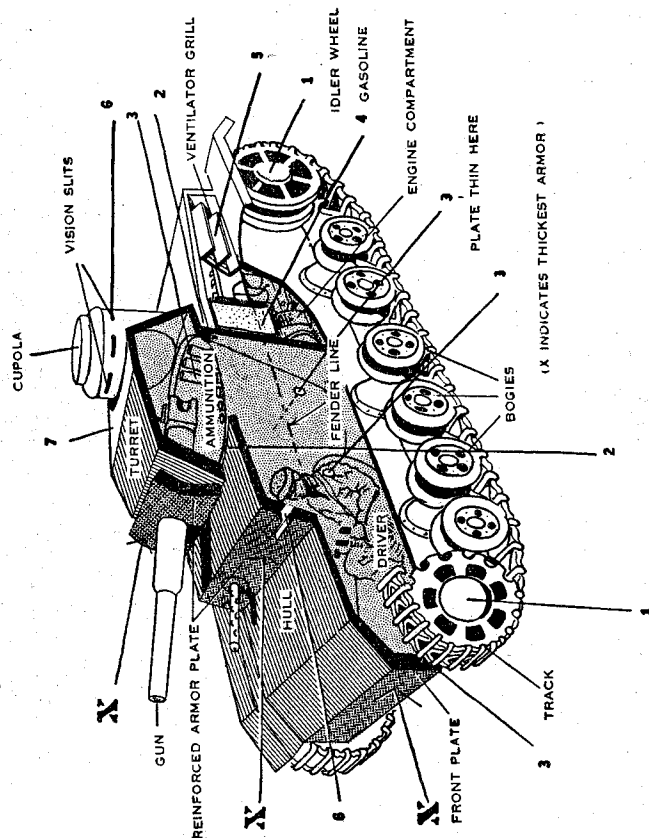


Figure 26. Vulnerable parts of a tank.

to the left of the line of sight to the target and drives the post in the ground.

(3) The squad leader measures approximately 12 inches to the right of the aiming post at the gun position and drives a stake indicating the position of the gun pintle when the gun is in position. He removes the aiming post at the gun position.

(4) When the gun is moved into position, the pintle is placed over the stake. Fire is opened and adjusted on the target by the squad leader. When a hit is obtained the gunner re-lays on the target and records the laying on the aiming post which appears on the telescope reticle. A confirming round is fired with the laying on the aiming post to insure that adjustment is correct.

**c. When the gun is in position and a hit has been obtained.** (1) Place the sight picture on the target so that the gun is laid as it was to obtain the last hit.

(2) No. 1, looking through the telescope, directs No. 2 to place the aiming post approximately 100 feet in front of the gun and in line with the 20 mil (or approximately 20 mil) marking to the left of the center of the reticle.

(3) For subsequent firing on the same target the gunner uses as his point of aim the marking on the aiming post which gives the proper range.

**d. When visibility is poor.** When visibility is poor, the point of aim on the aiming post is marked by the aiming post light.

CHAPTER 5

SUBCALIBER FIRING

Section I. GENERAL

**101. PURPOSE AND SCOPE.** *a.* The purpose of subcaliber firing is to give the gunner a close-up picture of the effect of each round fired and demonstrate the necessity for accurate laying in order to obtain hits on a target. During this training phase, the gunner learns uniform gun laying and firing. Each exercise should be critiqued with the emphasis on shooting for a good shot group.

*b.* Subcaliber firing includes 1,000-inch range and long-range field firing, initially for instruction practice and later for record practice.

*c.* Because two telescopes, with different units of lead, are issued for this gun, each telescope requires a different target in 1,000-inch moving target firing. Targets for each telescope are included in section III. The course to be fired using either telescope is included in section II.

**102. PROFICIENCY TEST.** Prior to subcaliber firing, all men will be trained thoroughly in the preceding steps of gunnery and will be required to earn a satisfactory credit in the gunner's proficiency tests. (See sec. II, ch. 7.)

Section II. QUALIFICATION COURSE

**103. GENERAL.** *a.* Each member of a squad equipped with the 57-mm gun M1, will fire the course given

below for qualification. Qualification scores are given in paragraph 115, as authorized in AR 775-10. For records and reports, see section II, Circular No. 265, War Department, 1943.

*b.* Rules governing the firing of the qualification course for record practice are prescribed in paragraph 114.

*c.* All moving target firing prescribed in this section, except table V, will be conducted on a 1,000-inch moving target range. The caliber .22-.30 subcaliber mount, M6, with modification for the 57-mm gun, bearing the caliber .22 subcaliber rifle M2A1 as issued by the Ordnance Department will be used for all firing on the 1,000-inch range. Stationary target firing, table I, may be conducted on a 1,000-inch range or other firing areas which meet safety regulations prescribed in AR 750-10.

*d.* The firing of tables I, II, III, and IV, using the M18 telescope, will be executed at an assumed range of 700 yards. The firing of tables I, II, III, and IV, using the M69C telescope, will be executed at an assumed range of 400 yards.

*e.* Firing on the field range will be executed as specified in paragraph 121, with caliber .30 tracer ammunition, fired from the caliber .30 subcaliber rifle M1903A2, mounted in the subcaliber mount, M6 modified. For type of target see paragraph 118.

**104. COURSE A.** *a.* **Instruction practice.** Fire tables I to V, inclusive, three times.

*b.* **Record practice.** Fire tables I to V, inclusive, once.

Table I. Stationary manipulation course, 1,000-inch (stationary gun—stationary target) Target C

Number of rounds	Time, seconds	Maximum score
5	31	20
5	31	20

Table II. Level course, 1,000-inch (stationary gun—moving target) Target A

Number of rounds	Speed, inches per second	Time of traverse, seconds	Lead	Maximum score
5	16	31	1	25
5	16	31	1	25
5	24	21	2	25
5	24	21	2	25

Table III. Hilly course, 1,000-inch (stationary gun—moving target) Target A

Number of rounds	Speed, inches per second	Time of traverse, seconds	Lead	Maximum score
5	12	41	0	25
5	12	41	0	25
5	16	31	1	25
5	16	31	1	25

Table IV. Level manipulation course, 1,000-inch (stationary gun—moving target) Target B

Number of rounds	Speed, inches per second	Time of traverse, seconds	Lead	Maximum score
5	12	41	0	25
5	12	41	0	25
5	16	31	1	25
5	16	31	1	25

NOTE. Targets will be run successively from left to right and right to left in tables II, III, and IV.

Table V. Field range (stationary gun—moving target) Target D

Range	Number of rounds	Speed	Lead	Direction of movement of target
Moving on a diagonal from 600 yards to 400 yards.	12	15 miles per hour.	As necessary.	Left to right back to left twice. Exposed 25 seconds 3 rounds each run.

### Section III. CONDUCT OF 1,000-INCH RANGE INSTRUCTION AND RECORD PRACTICE FIRING

**105. GENERAL.** This section includes discussion of the ranges and targets to be used and the method of conducting instruction and record firing on the 1,000-inch range.

**106. 1,000-INCH RANGE.** Ranges are constructed to specifications in TM 9-855 and in accordance with safety restrictions prescribed in AR 750-10. A single range unit is necessary for each three-gun platoon. Two of these range units per platoon will facilitate the conduct of 1,000-inch firing. A range unit consists of two runways, one level and the other hilly, on which a sled target moves to simulate the various movements and speeds of probable combat targets. The sled is moved by a wire cable which runs from a hand-operated drum through a system of pulleys. The wire cable is fastened to both ends of the sled. An aiming stake should be placed midway between the two screens and close to the track. Preparation of the range for stationary target firing is explained in paragraph 109.



107. **1,000-INCH MOVING TARGET FOR M69C TELESCOPE.** The targets for 1,000-inch range moving-target firing using the M69C telescope are shown in figures 27 and 28. The target labeled *A* (fig. 27) is used in tables II and III. The target labeled *B* (fig. 28) is used in table IV. Both targets have aiming silhouettes and scoring spaces for two individual scores.

a. Target *A* is printed with six black aiming silhouettes, each for a separate exercise. The numeral printed under each silhouette indicates the gun to be assigned to that target. In each vertical row of aiming silhouettes, the upper silhouette constitutes both the aiming and scoring space for the zero-lead exercise. (See table III.) The silhouettes just below the zero-lead targets are the aiming spaces for the one-lead exercise (tables II and III); the scoring spaces being outlined by black lines to the right and left of the aiming spaces. Part of the scoring space overlaps into the aiming space. The remaining two silhouettes with their appropriate scoring spaces to the right and left are used for firing the two-lead exercises. (See table II.)

b. Target *B* is printed with ten black aiming silhouettes with a one-lead scoring space to the right and left of each. Each black aiming silhouette constitutes both the aiming space and the scoring space for zero lead. The one-lead scoring spaces are placed as on target *A*. No. 1 gun (left) is assigned the group of five targets on the left of the target and No. 2 gun (right), the group of five on the right, as indicated by the numerals under each aiming silhouette. One shot is fired at each silhouette on each run of table IV.

108. **1,000-INCH MOVING-TARGET FOR M18 TELESCOPE.** Because of the larger unit of lead taken with the M18 telescope, it is necessary to use a different target in 1,000-inch moving-target firing. No standard target is available for issue and therefore, one must be improvised locally. One method of improvising this target is shown in figure 29. Tables II, III, and

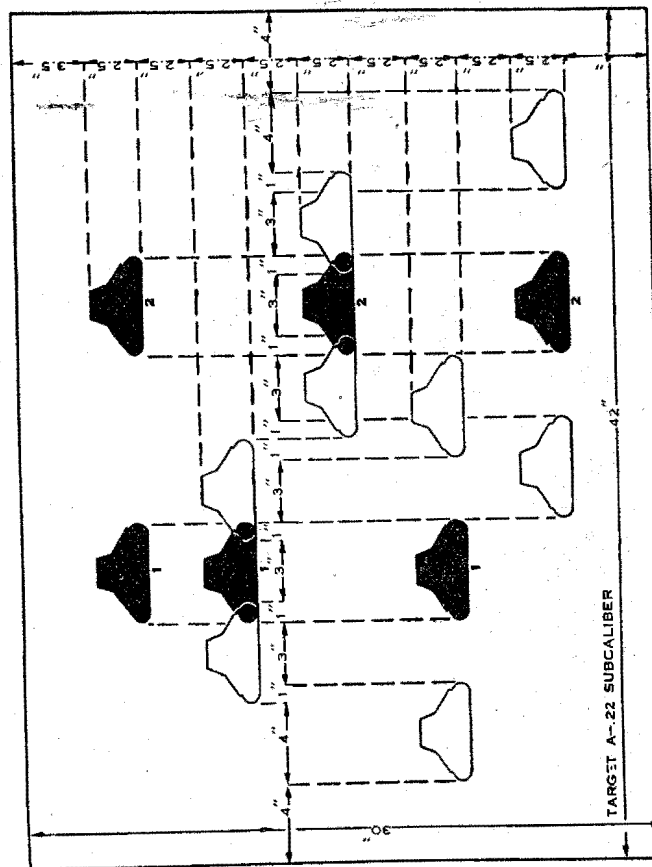


Figure 27. Target *A*, 1,000-inch, for M69C telescope.

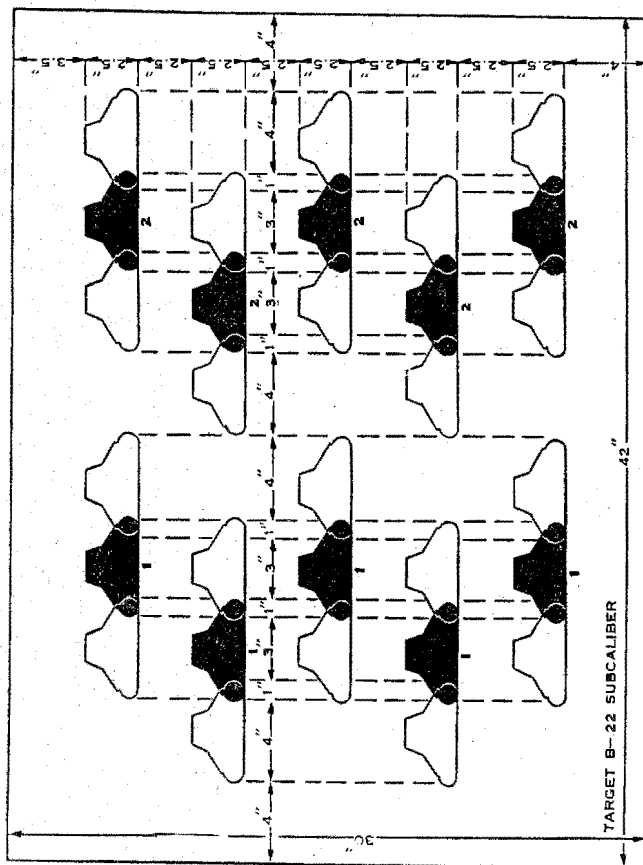


Figure 28. Target B, 1,000-inch, for M69C telescope.

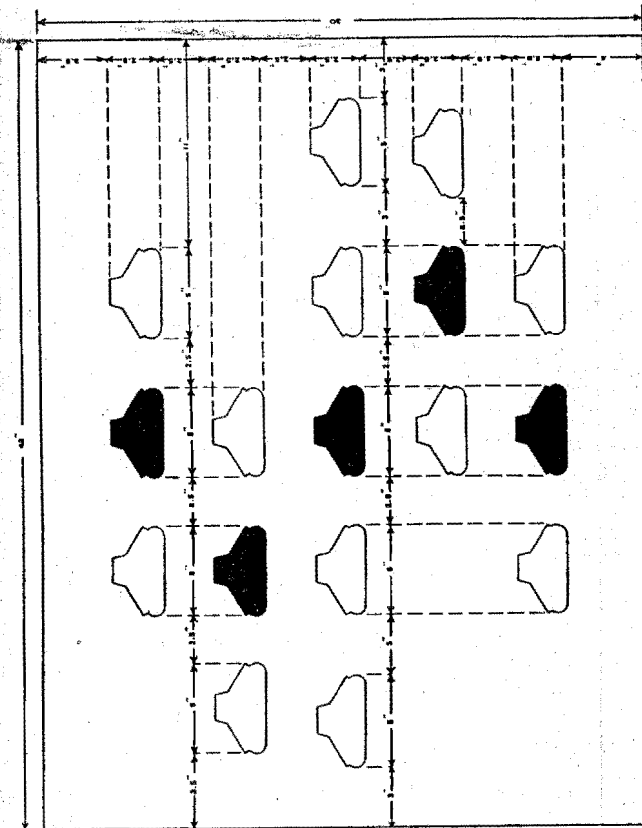


Figure 29. Target, 1,000-inch (improvised), for M18 telescope.

IV can be fired on this target; however, it has aiming spaces for only one gun. Dimensions on the improvised target give the correct placement of the aiming and scoring spaces. Aiming and scoring spaces may be reproduced from figure 30.

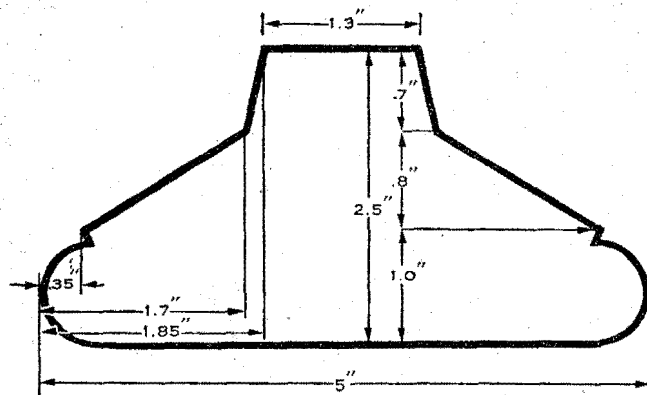


Figure 30. Full-scale aiming silhouette for use in improvising 1,000-inch targets.

**109. 1,000-INCH STATIONARY TARGET** (fig. 31). The target (target C), which must be improvised locally, consists of five 5-inch squares of pasteboard mounted on uprights at the same height from the ground as the level of the axis of the gun and at a distance of 1,000 inches from the gun pintle. Intervals between targets will vary. However, the overall width will not exceed 25 feet for the five targets. Each of the five targets will be numbered, No. 1 target in the center of the group.

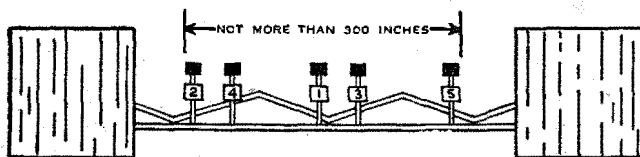


Figure 31. Target C. constructed on 1,000-inch range unit.

**110. DUTIES OF PERSONNEL. a. Officer in charge.** The officer in charge of range practice, detailed by the unit commander, is responsible for —

(1) Assignment, coordination, and supervision of ranges and firing areas.

(2) Timely arrangements with the range officer for repairs or alterations of installations.

(3) Procurement of supplies for firing units.

(4) Enforcement of safety precautions prescribed herein and in AR 750-10.

(5) Interpretation of such parts of this manual as may be referred to him for decision.

**b. Range officer.** The range officer is normally a member of the unit or post commander's staff. He is responsible for —

(1) Procurement and distribution of range supplies.

(2) Supervision of construction, alteration, or repair of range installations.

(3) Establishment of safety limits of ranges and coordination of firing to comply with the provisions of AR 750-10.

**c. Company commander.** (1) The company commander is responsible for the efficiency of the marksmanship training of his organization and the conduct of its firing in accordance with the provisions of this manual.

(2) He, or his commissioned representative, will supervise and control all firing personally. He will give, or cause to be given by his representative, appropriate fire orders and signals for firing and for movement of the target(s). The commands LOAD, COMMENCE FIRING, CEASE FIRING, CLEAR GUN, and CHANGE TARGETS, will be given for each order.

(3) During all firing, he, or his commissioned representative, will enforce rigidly local range regulations, safety precautions and instructions pertaining to the service of the piece prescribed herein.

**d. Scoring officers.** (1) Scoring officers will be detailed to supervise record practice firing. Officers for this duty will be detailed from organizations other than the one firing. They will familiarize themselves thoroughly with their duties and the firing procedure

on the 1,000-inch range prior to the date of record practice firing. The number of scoring officers detailed during record practice firing will be not less than one for each 1,000-inch range unit being operated.

(2) Specific duties of the scoring officers are to —

(a) Inspect loaded magazines and count number of rounds of ammunition to be fired by the gunner for each exercise.

(b) Check dimensions of the targets, aiming silhouettes, and scoring spaces, and see that the range is laid out as prescribed.

(c) See that firing is conducted in accordance with the prescribed procedure.

(d) Verify and render decisions on all misfires, stoppages, and malfunctions at the guns.

(e) Render a decision in event of breakage or stoppages in any of the range apparatus or mechanism.

(f) Inspect each target before it is placed on the sled. Make sure that initially it contains no shot holes and that, after being fired on, it has no unpasted holes before being used for another exercise.

(g) Count the number of shot holes in appropriate scoring space for each exercise fired, score target (s), and record the score.

(h) Check time of exposure of target on each run, and render a decision in event of irregularities.

**e. Assistant instructor.** (1) During all preparatory training and instruction firing, an assistant instructor will be present at each gun to instruct and assist the gunner. His specific duties are to —

(a) Require each man to observe all pertinent individual and general safety precautions, and see that he complies with the instructions pertaining to the service of the piece.

(b) See that the proper amount of ammunition is at the gun and that magazines are loaded with the specified number of rounds for each exercise.

(c) Supervise generally the work at the gun, making

sure that the commands LOAD, COMMENCE FIRING, CEASE FIRING, UNLOAD AND CLEAR GUN, and CHANGE TARGETS, are executed properly; to repeat orders or instructions when necessary to insure correct understanding and timely execution by the gunner (No. 1) and loader (No. 2).

(d) See that the gunner executes the firing exercises in accordance with prescribed procedure.

(e) Report all misfires, stoppages, malfunctions, or discrepancies to the officer conducting firing.

(f) Score the target when directed and discuss the execution of the exercise (during instruction practice only) with the gunner.

(2) During record practice firing the assistant instructor will not be present at or near the gun. Except under the conditions prescribed in g below, no coaching of the gunner will be permitted.

**f. Loader.** (1) The primary duty of the loader (No. 2) is to serve the piece during all firing exercises. During instruction practice, he may perform additional duties at the gun or act as an assistant coach in accordance with orders of the assistant instructor. *During record practice firing, he does not coach or instruct the gunner in any way.* (See g below.)

(2) Specific duties of the loader are to secure and have ready for use at the gun the prescribed number of magazines properly loaded for each exercise. He serves the piece as follows:

(a) Loads the subcaliber rifle in accordance with the commands of the officer conducting firing.

(b) When the rifle is loaded and ready to fire, reports, "Up" to the gunner, and when the gunner is ready to begin the exercise, signals, "Ready" to the officer conducting firing.

(c) Repeats all orders to unload, cease firing, and clear gun, and sees that the orders are complied with as described in paragraph 41.

(d) Announces, for the gunner's benefit, when the prescribed number of rounds for each run of the



target has been fired, thus, "Five rounds complete."

(3) He reports all misfires and malfunctions or stoppages to the assistant instructor (scoring officer during record practice firing). During instruction practice firing, in case of a misfire, he immediately re-cocks the rifle without command by raising the bolt handle and attempts to ready the gun for firing as quickly as possible. In case of a minor malfunction or stoppage, such as failure to feed another round into the chamber when the bolt is operated or failure to extract, he remedies the condition without command and as quickly as possible. In case of a misfire, stoppage, or minor malfunction during record practice firing, he proceeds as described in paragraph 114k.

(4) He reloads the gun without command, upon the completion of a run of a moving target.

(5) He exchanges targets on the sled as directed. To expedite operations, he may be assisted in this duty by another member of the squad. At the command CHANGE TARGETS, he secures the target that has been fired on from the sled and returns it to the assistant instructor (scoring officer in case of record practice firing), and sets up the new target.

**g. Coaching.** Coaching is permitted during record practice firing for the period in which no additional compensation for arms qualification is authorized. The following exceptions are made:

(1) The coach will not use any mechanical aid, such as an aiming device to assist the gunner.

(2) The coach will not touch any part of the gunner's body while the gunner is sighting or firing.

**h.** When additional compensation for arms qualification is authorized, the provisions of e (2) above will be effective.

**111. GUNS, MOUNTS, AND TELESCOPES. a.** The gun, subcaliber mount, telescopes, and .22 subcaliber rifle will be used as issued by the Ordnance Department

without addition or modification, except as authorized in paragraph 21.

**b.** Before marksmanship firing is begun, each gun, mount, telescope, and all accessories to be used will be examined thoroughly and repaired or adjusted to insure efficient functioning. Excessive play will be removed from the guns and mounts, and adjustments made to permit smooth manipulation.

**c.** Prior to firing, the gun will be targeted carefully for 1,000-inch firing according to the following procedure:

(1) *Telescope M69C.* (a) Place a blank target in the middle of the level course.

(b) With the gun in position on the 1,000-inch firing line, fire three rounds into the blank target without changing the laying of the gun.

(c) Mark the center of the shot group so that it is visible through the telescope, and without changing the laying of the gun, move the telescope by means of the vertical and horizontal collimation drums so that the 400-yard aiming point along the column of vertical lines is laid on the center of the shot group. Tighten the lock nuts.

(d) Check the sighting by firing three more rounds at another point on the target, and by checking to see that the 400-yard-range aiming point is laid on the center of the shot group. If it is not, move the telescope again without changing the laying of the gun.

(2) *Telescope M18.* (a) Set the range quadrant at 700, and do not change this setting until firing is completed.

(b) Place a blank target in the middle of the level course.

(c) With the gun placed in position on the 1,000-inch firing line, fire three rounds into the blank target without changing the laying of the gun.

(d) Mark the center of the shot group so that it is visible through the telescope and, without changing the laying of the gun, move the telescope by means of

the adjusting screws until the intersection of the vertical and horizontal cross hairs is laid on the center of the shot group. On some guns it may be necessary to place a thin washer around each of the two rear bolts between the telescope mounting bracket and the elevating mechanism bracket, in order to get enough right deflection. Tighten the jam nuts.

(e) Check the sighting by firing three more rounds at another point on the target and by checking to see that the cross hairs are laid on the center of the shot group.

(3) The telescope with which the gun is to be equipped during marksmanship firing will be used for targeting.

d. *After 1,000-inch firing has been completed, the gun will be boresighted immediately.*

**112. AMMUNITION.** Ammunition in the amounts shown in the table for each score will be loaded in magazines and inspected before firing. For long-range subcaliber firing tracer ammunition will be used.

**113. PROCEDURE FOR FIRING. a. General.** (1) All firing will be controlled by definite fire orders.

(2) During the initial phases of instruction firing, the officer conducting firing may, at his discretion, reduce the speed of the target and the number of rounds fired from those prescribed in the tables. The object of this procedure is to place emphasis initially upon smooth continuous tracking.

(3) For moving targets, a run of the target across the course once in each direction at the same speed will constitute an exercise. For stationary targets, an exercise includes two time intervals in which the gunner fires a total of 10 rounds at stationary targets, 5 in each interval.

(4) Exercises are fired in the order in which they are listed in the tables.

(5) During instruction firing only, when time is

available, the firing of each table may be preceded by one or more dry runs.

**b. Organization.** For functional purposes, an organization similar to that described in tracking and simulated firing training (par. 71) is suggested. The organization must be modified to meet the requirements of firing live ammunition. During instruction firing only, one group of two guns may fire on each range unit, if targets permit.

**c. Duties.** All personnel will perform the duties prescribed in paragraph 110. During instruction firing, an assistant instructor, gunner (No. 1), and a loader (No. 2) will be at each gun. A third man from each squad may be assigned the duty of loading magazines and furnishing them to the loader. A line of small loading benches placed a short distance (about 5 yards) in rear of the guns will facilitate loading and assure a prompt supply of ammunition to the guns. Other members of the squads may be employed in operating the range and preparing targets for firing.

**d. Instruction practice firing (moving targets).** Before firing on the 1,000-inch range, the officer conducting firing will give a general description of the range and announce specific instructions pertaining to firing procedure.

(1) Guns are placed on the firing line with the pintles 1,000 inches from the rear of the level course. Guns are placed to the right and left of the center stake (par. 106) and as close together as the spread of the trails will permit.

NOTE. For all 1,000-inch range firing, the trail spades must be dug in so that the saddle (top carriage) bracket of the gun carriage is level. Leveling the saddle (top carriage) bracket permits the gun to be traversed in a true horizontal plane without the use of the elevating mechanism. The firing supports will be in position.

(2) No. 1 gun is assigned the portion of the target

marked "1". No. 2 gun is assigned the portion of the target marked "2".

(3) The assistant instructor, gunner, and loader take positions at the gun. The gunner tests the firing, elevating, and traversing mechanisms. The loader secures the necessary ammunition.

(4) When all guns are prepared for firing, all safety precautions having been taken previously, the officer conducting firing gives the fire order.

(5) An example of the sequence of a fire order is as follows:

(a) GUNS ON AIMING STAKE, TWO MAGAZINES, FIVE ROUNDS EACH, LOAD. At these commands, the gunner aims at the aiming stake and the loader reports, "Up" when the gun is loaded and ready to fire. When the gunner is ready to begin the exercise, he so indicates to the loader who signals, "Ready."

(b) In the meantime, for moving targets, the officer conducting firing will have specified to the timekeeper at the drum the course to be traveled by the target and the time of exposure for the exercise.

(c) When all guns have signaled, "Ready," the officer conducting moving-target firing will give a signal to start the target and simultaneously order: LEFT FRONT, TOP (RIGHT, LEFT) TANK, SEVEN (FOUR) HUNDRED, ZERO (ONE, TWO) LEAD (S), COMMENCE FIRING.

(6) As the phrase LEFT FRONT of the fire order is given, the gunner will start traversing toward the left of the range. Upon the appearance of the target from behind the screen, he will engage it, using the announced range and lead, aiming on the announced black silhouette, and firing the number of rounds contained in the magazine. The loader will announce, "Five rounds complete (or appropriate number)" when the magazine is empty. For training purposes, the gunners will be required to track the target dur-

ing its entire time of exposure, even though they have fired the required number of rounds for the run.

(7) When the target is obscured behind the screen, prior to its return run, the loader, without command, will rapidly remove the used magazine and unfired rounds remaining in the rifle and reload with the second magazine provided for the return run of the exercise. As soon as this operation is complete, he will report, "Up" and signal, "Ready" to the officer conducting firing.

(8) Immediately upon indication that all guns are ready and without further oral orders, the officer conducting firing will cause the target to be started upon its return run. The gunner engages the target as indicated in (6) above, traversing from right to left, completing his double run. The gunner will not relay his gun on the aiming stake while the target is obscured between runs of an exercise but will continue to aim at the place where the target disappeared, prepared to re-engage it the instant it reappears.

(9) Upon completion of an exercise, guns are relaid on the aiming stake and firing is continued as described in (3) to (8), inclusive, above.

(10) Upon completion of an exercise, guns are cleared, targets are brought to the gun positions, and the result recorded, analyzed, and discussed.

(11) Upon orders from the officer conducting firing, targets will be replaced and a new order started.

**e. Instruction practice firing (stationary targets).** The procedure for the conduct of fire on stationary targets is generally the same as for moving targets with the following exceptions:

(1) The sequence of a fire order for a stationary target is as follows: GUN ON LEFT TARGET, ONE MAGAZINE, FIVE ROUNDS, LOAD. At these commands, the gunner aims at the left target (par. 109) and the loader reports, "Up," when the gun is loaded and ready to fire. When the gunner is ready to begin the exercise, he so indicates to the loader, who signals, "Ready."



(2) When all guns have signaled "Ready," the officer conducting firing will order: FRONT, CENTER TARGET, SEVEN (FOUR) HUNDRED, ZERO LEAD, COMMENCE FIRING.

(3) As the command FRONT of the fire order is given, the gunner will start traversing toward the center target on the range. As soon as the command COMMENCE FIRING is given, the gunner fires one round in the center target, after which he fires one round in each of the other targets in the order in which they are numbered. Time is taken from the command COMMENCE FIRING. When the fifth round of a clip has been fired, the loader announces, "Five rounds complete."

(4) At the end of the time interval, the officer conducting firing, commands: CEASE FIRING. The loader rapidly removes the magazine and unfired rounds. The targets must be scored before the second half of the exercise can be fired.

(5) As soon as the targets have been scored, the results recorded, analyzed and discussed, the second half of the exercise is fired as described in (1) to (4) inclusive, above.

**114. RULES AND PROCEDURE FOR RECORD PRACTICE FIRING.** a. Record practice firing will consist of firing the course prescribed in paragraph 104. The procedure for conducting instruction practice firing applies to record practice firing, except as noted below:

b. Each man will complete the prescribed instruction practice firing for the course specified prior to record practice firing.

c. Once record practice of an individual has commenced, it will be completed without interruption by any other form of firing.

d. As a rule, record practice firing will not be fired by any individual on the same day that he fires any part of instruction practice firing. However, when the time allotted is very limited, the officer in charge of

firing may authorize record practice firing on the same day.

e. No organization (company or platoon) will conduct instruction practice and record practice simultaneously on the same 1,000-inch range unit.

f. Before firing any exercise for record, the gunner will be required, and will be given a reasonable length of time, to check the condition of his gun, telescope, and ammunition.

g. For record practice firing, only one gun will fire on each range unit at a time. No improvised supports for the gun or gunner will be employed during firing.

h. The target speed for any run or the time interval in which the gunner must fire an exercise or a portion of an exercise will not be announced to the gunner.

i. The decision to disregard a score because of a failure to comply with the specified time limits or because of faulty operation of the target, rests with the scoring officer. He will require each moving target to be operated in such a manner that it will traverse the prescribed course for each run at a uniform rate of speed throughout its entire time of exposure. A variance of 3 seconds under or over the prescribed time for any run will be permitted. If the time of exposure exceeds the prescribed time by more than 3 seconds, the score will be disregarded. If the time of exposure is less than the prescribed time by more than 3 seconds, the gunner will be required to state whether he wants the score to stand before he examines the target. If he chooses to fire the exercise again, he will be permitted to do so. Otherwise the score will be recorded as fired. No variance in time limits for stationary targets will be allowed.

j. Portions of an exercise will be fired in as rapid succession as possible. After a portion of a moving-target exercise has been fired, the loader will be required to load the gun for the balance of the exercise as rapidly as possible, and signal, "Ready" as soon as the gun is ready for firing. For moving targets, the



target will be started on its return run within 5 seconds after the loader has signaled, "Ready."

k. In record practice firing, when a misfire, stoppage, or malfunction occurs, the gunner or loader will hold up his hand and call, "Stoppage." Thereafter, neither the gunner nor loader will touch the gun until so instructed by the scoring officer. The scoring officer will examine the gun.

l. If a misfire, stoppage, or malfunction occurs through no fault of the gunner the score will be disregarded and the gunner will be permitted to refire the exercise.

m. If the misfire, stoppage, or malfunction is manifestly the fault of the gunner due to incorrect manipulation of the gun, the gunner will not be permitted to refire the exercise. Only that part of the exercise which was completed will be scored.

n. Should a mechanical stoppage occur, the gun or subcaliber rifle will be repaired or a different gun or subcaliber rifle substituted and the exercise refired. Substituted guns, which have been repaired, must be retargeted before they are used for firing.

#### 115. SCORING AN INDIVIDUAL QUALIFICATION. a.

**General.** (1) Any departure from the mandatory provisions of this manual will disqualify the man affected for qualification.

(2) After a man has taken his place at the gun, all shots fired by him will count as a part of that exercise.

(3) Failure to use the prescribed aiming silhouette for an exercise or any part thereof will result in hits in the wrong scoring spaces. The gunner who places his hits in the wrong scoring spaces will not be permitted to refire the exercises and will score only those hits which are found in the appropriate scoring space for the designated aiming silhouette.

(4) A hit will be scored for each bullet hole found in the correct scoring space, except that no more hits will be counted in any scoring space (s) than the num-

ber of rounds authorized to be fired at that space. The maximum number of hits to be counted in each of the scoring spaces for a double run of a moving target is:

Zero lead—ten hits each scoring space.

One lead and two leads—five hits each scoring space.

Zero lead (target B)—two hits each scoring space.

One lead (target B)—one hit each scoring space.

The maximum number of hits on each stationary target for one-half the exercise is one.

(5) The shot holes in the target will be counted after each moving-target exercise. For table I, Stationary Target Exercise, the shot holes will be counted after the first five rounds fired. If the number of holes exceeds the number of rounds authorized, the gunner will be penalized five points for each round in excess of the allowance.

(6) During record practice firing, the name of the individual will be placed on the target he is to use before he fires on it. No person will handle the target until after it is scored except under the direct supervision of the scoring officer or his assistant.

(7) A bullet hole which touches the line of a scoring space will be counted as a hit.

(8) Ammunition not fired during the time of exposure of the target for each run of an exercise will be forfeited.

(9) Holes made by ricocheting bullets, rocks, or other foreign matter, will not be counted.

**b. Computation of scores.** (1) Subject to the conditions specified in a above, a total of five points will be counted for each hit in a correct scoring space except in firing the stationary manipulation target. In the scoring of table I, one miss in each five rounds fired will penalize the firer five points; two misses will penalize the firer fifteen points; three or more misses,

no score for that portion of the exercise. The total possible score on table I is forty points for the ten rounds.

(2) The following indicates the total possible score for the authorized A course:

Table I	Table II	Table III	Table IV	Table V	Total possible
40	100	100	100	60	400

**c. Score cards.** Each individual entry for record practice will be made on the score card in ink or indelible pencil and will be authenticated by the scoring officer. Erasures are not permitted. Alterations will be made only by the company commander or the officer who acted as scorer. Such corrections will be authenticated by the officer making the correction.

**d. Individual qualification.** Individual classification and qualification scores are as follows:

	Course A
Expert gunner .....	300
First-class gunner .....	255
Second-class gunner .....	225
Unqualified .....	Less than 225

#### Section IV. CONDUCT OF LONG-RANGE SUBCALIBER FIRING

**116. GENERAL.** This section describes ranges, rules and regulations to be used in the conduct of long-range subcaliber firing. The qualification course to be fired on the field ranges is included in section II.

**117. FIELD RANGE. a. Arrangement.** This range provides one moving target course, running diagonally

from left to right between ranges from the firing line of 600 yards and 400 yards. The length of the target course between the marker flags is  $183 \frac{1}{3}$  yards, the distance traveled by the target in 25 seconds moving at 15 miles per hour. Details of its construction are found in TM 9-855.

**b. Operation.** (1) A pit or target detail controlled by radio or telephone will change, mark, and operate the targets as directed from the firing line.

(2) The speed of the towing motor or vehicle must be regulated so that targets move steadily at 15 miles per hour between the marker flags limiting the course. Starting and stopping positions for the towing vehicle when used are marked clearly.

**118. TARGET.** The target for field range firing will consist of an olive drab panel 5 feet by 8 feet mounted on a target sled. Targets may be arranged in tandem to permit firing of two guns simultaneously during instruction firing.

**119. DUTIES OF PERSONNEL.** Duties of personnel on the field range in conducting long-range subcaliber firing will be the same generally, as those for 1,000-inch firing.

**120. GUNS, MOUNTS, AND TELESCOPE. a.** The gun, subcaliber mount, telescope, and caliber .30 subcaliber rifle will be used as issued by the Ordnance Department without addition or modification, except as specifically authorized in paragraph 21.

**b.** Prior to firing, each gun will be carefully bore-sighted by either of the methods prescribed in TM 9-303.

**121. PROCEDURE FOR FIRING.** The procedure for long-range subcaliber firing will be identical with 1,000-inch moving target firing with the exceptions set forth below.

**a. Instruction practice firing.** (1) Two guns will be placed on the firing line. The guns will be numbered from left to right. The No. 1 gun will fire on the left target, the No. 2 gun on the right target.

(2) **Fire orders.** Initially all guns firing will be laid on the center of the target course by the command: ALL GUNS ON CENTER. As the targets approach the starting limit flag, guns will be brought on the target by the command: LEFT (RIGHT) FRONT, TARGET SIX (FOUR) HUNDRED, ONE (TWO) LEADS, COMMENCE FIRING. The gunner will fire, call his shot mentally, sense the trace or strike, adjust, and continue to fire until the loader announces, "Three rounds complete," or until the command CEASE FIRING is given.

(3) In this firing, in addition to the gunner (No. 1) and loader (No. 2) a coach and an observer are necessary at each gun. The coach observes the actions of the gunner and loader, and the observer assists the gunner in sensing and adjusting the fire.

(4) The complete exercise will include two double runs of the target. Each gunner will fire 3 rounds during each exposure or target run, a total of 12 rounds for the exercise.

**b. Record practice firing.** The rules for conducting instruction practice firing apply to record practice as well.

**122. SCORING AND INDIVIDUAL QUALIFICATION.** See paragraph 115.

## Section V. SAFETY PRECAUTIONS

**123. GENERAL.** This section prescribes the safety precautions which will govern the firing of the 57-mm gun M1, with either subcaliber or service ammunition. Guiding references are AR 750-10, TM 9-1900, and 9-303.

**124. RANGE SAFETY.** **a.** Range specification and safety requirements must conform with instructions set forth in AR 750-10.

**b.** Danger flags will be displayed at prominent positions on the range during all firing.

**c.** Range guards will be posted to prevent traffic through danger areas.

**d.** Markers will be placed so as to define clearly the right and left to limits of fire.

**e.** Vehicles and personnel working on the range will carry red flags so that they can be seen at all times. Signals or commands directing their movement must be definite and unmistakable.

**f.** Starting positions for towing vehicles will be at a safe distance on the flank opposite to that on which the target appears.

**125. PERSONNEL.** The following are additions to the duties and responsibilities of individuals listed in paragraph 110.

**a.** The officer in charge of firing will ascertain that—

(1) The range is clear before firing commences.

(2) Guns are loaded only upon command of the officer in charge.

(3) No guns are fired except under the direct supervision of an officer and upon command of the officer in charge.

(4) No person is allowed in front of a gun for any purpose until so directed by the officer in charge and then only after all guns have been cleared and inspected by an officer.

(5) No gun leaves the firing line or position until it has been cleared and inspected by an officer. The inspection for determining that a gun is clear will be made by inserting the fingers into the chamber of the gun.

(6) All personnel are instructed in the significance of range flags, safety markers, and safety precautions; they are instructed to command CEASE FIRING, or give

the prescribed signals therefor, upon observing any condition which makes firing unsafe.

b. At each gun firing, there will be a safety officer or noncommissioned officer, who will ascertain that—

(1) The bore of the gun is kept clear and free of all obstructions before firing, by running the rammer staff completely through the bore.

(2) Excess oil and grease have been removed.

(3) Ammunition at the gun is placed so that it cannot ignite, explode, or detonate in case of an accident at the gun.

(4) Ammunition is clean and free of grease, oil, and dirt.

(5) The gun is loaded and fired only upon command.

(6) Firing ceases immediately upon the command CEASE FIRING, regardless of the source of the command.

(7) The gun never fires outside the prescribed safety limits.

(8) The gun is clear and the gunner stands away from it before the target detail moves into the range.

(9) When firing service ammunition the gunner, until the trails are seated, holds his eye 20 to 25 inches from the telescope and keeps his body clear of the recoiling gun and carriage.

(10) The loader, No. 2, is clear of the recoiling gun and carriage.

**126. AMMUNITION. a.** Handling of ammunition must conform with instructions set forth in TM 9-303 and 9-1900.

b. Misfires will be handled as prescribed in AR 750-10.

## CHAPTER 6

### SERVICE FIRING

#### Section I. GENERAL

**127. PURPOSE AND SCOPE. a.** Prior to firing service ammunition, each squad member must demonstrate thorough proficiency in all phases of gunnery training thus far discussed. His ability to maintain the gun in action and deliver effective fire on a target, as outlined in chapters 3, 4, and 5 must be a matter of habit; for, it is now that he will be introduced to the blinding and flash effect encountered in firing service ammunition, an effect which can be minimized only through correct habits acquired during training.

b. Training in this chapter comprises three progressive steps, as follows:

(1) Preparatory exercises, initial and subsequent laying.

(2) Basic firing, during which each squad member becomes accustomed to firing service ammunition.

(3) Combat range firing, during which the gun squad applies its gunnery training to firing service ammunition at field targets under simulated combat conditions.

c. Immediately prior to commencing preparatory exercises each gunner must demonstrate his proficiency in the duties of gunner by earning a satisfactory credit in the gunner's proficiency tests. (See sec. III, ch. 7.)

#### Section II. PREPARATORY EXERCISES

**128. GENERAL.** This training consists of a series of



exercises designed to train squad members to make range and lead estimations quickly and accurately and deliver correct fire orders with clarity and force. Initial laying exercises should require the other members of the squad, not acting as squad leader, to take positions at the gun as gunner and loader performing their duties as the acting squad leader issues fire orders.

### 129. INITIAL LAYING EXERCISES. a. Course (fig. 32).

This course includes stationary targets, with and without vertical profile, and moving targets. The course should include the various types of combat vehicles operating at constant speeds through known distances. It lends reality to the instruction to use different types of armored vehicles when available, since the size of a combat target (armored car or tank) will have a definite influence upon the estimation of its range and speed. Before beginning laying exercises, the squad should be given an opportunity to note the appearance of available types of armored vehicles at ranges between 200 and 1,500 yards, at different angles to the firing point.

**b. Conduct of exercises.** The instructor requires individuals to make estimations and deliver initial orders for each of the exercises listed below. He critiques each order, emphasizing correctness of commands, accuracy and speed of estimations, clarity and force of the orders given. He demonstrates methods of target designation other than that used in the fire order.

(1) *Exercise No. 1.* Each man estimates the range and announces the correct initial fire order for engaging stationary targets; then repeats the order, using different methods of target designation.

(2) *Exercise No. 2.* A vehicle moves parallel to the front of the group at a range of 200 to 300 yards. Each man estimates the range and speed of the target, announces the corresponding lead, and delivers the cor-

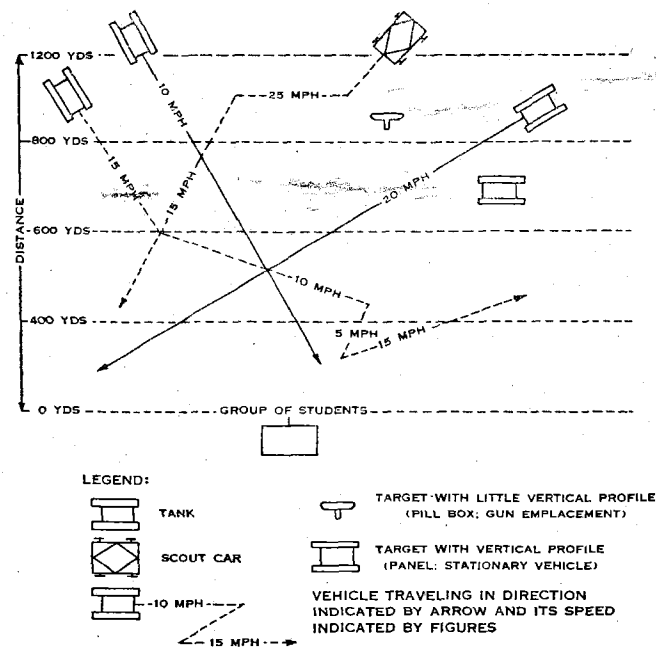


Figure 32. Course for preparatory exercises.

rect initial fire order. It is advisable to start off with a speed of 5 miles per hour and gradually increase the speed as the men become proficient in their estimations. Successively, similar courses are taken by the vehicle at ranges up to 1,500 yards.

(3) *Exercise No. 3.* In this exercise, the vehicles approach or recede at different angles and speeds as shown in figure 32. Each man estimates the range and speed of the target, announces the corresponding lead, and delivers a correct fire order for each run.

(4) *Exercise No. 4.* A number of vehicles appear unexpectedly from various directions and at various

ranges and speeds. The instructor requires each member of the squad to simulate shifting fire from one target to another, changing only those elements of the initial order which are not applicable to the new target.

**130. SUBSEQUENT LAYING EXERCISES. a.** The purpose of this training is to give each member of the squad practice in the application of the technique of sensing and adjustment and in the delivery of subsequent fire orders. Sensings and commands will be delivered orally so that the entire squad can benefit from the instruction given and participate in the critique at the conclusion of each exercise.

**b. Conduct of exercises.** The instructor will announce the initial order, mark the strike or trace in relation to the target, and require individuals to make the correct sensings and deliver the necessary subsequent orders. These are blackboard exercises and may be conducted in classrooms or on the range. For each exercise the instructor draws a picture of the target on the blackboard, announces the initial order, and marks the trace or strike of the first round. Each individual is then required to make a correct sensing and deliver the necessary subsequent order for obtaining an effective hit on the target. Successive sensings and orders should be listed on the blackboard for use in the critique.

(1) *Exercise No. 1.* The target is a stationary tank (vertical profile). The first round is high and to the right.

(2) *Exercise No. 2.* The target is a pill box (little or no vertical profile). The first round is high enough to require a 400-yard range change before a bracket is obtained.

(3) *Exercise No. 3.* The target is a pill box (little or no vertical profile). The first round is low, but close enough to require only a 200-yard range change.

(4) *Exercise No. 4.* The target is a tank, moving

directly across the front at a speed of 15 miles per hour. The first round is high and behind the target.

(5) *Exercise No. 5.* The target is an armored car moving directly across the front at a speed of 25 miles per hour. After the first round, which is ahead, the target changes direction.

### Section III. BASIC FIRING

**131. GENERAL.** Training in this phase introduces the squad to the effect of muzzle blast and recoil shock. It is designed to teach the squad, particularly the squad leader and gunner, to function efficiently as a team in the delivery of effective fire on known distance targets. Because of muzzle blast and recoil shock the gunner is unable to observe the trace of strike of the projectile fired; hence, he must note the laying of the gun used at the instant he fires and mentally call the shot so that he can make the correct adjustments ordered by the squad leader. The squad leader must take a position outside the limits of the muzzle blast, sense each round immediately, and deliver subsequent fire orders clearly and audibly. Teamwork between the squad leader and the gunner, and efficient service of the piece by the other members of the squad are essential.

**132. BASIC FIRING EXERCISES. a. Range.** (1) Basic firing may be conducted on the range described in paragraph 117. Stationary targets, with and without vertical profile, are set up at ranges between 600 and 1,200 yards for stationary target exercises. The firing line is moved back so that ranges up to 800 yards from the moving-target course can be used.

(2) *Operation.* For moving-target firing, the target is moved initially at 5 miles per hour. As firing progresses, the speed of the target is increased.

(3) *Targets.* Moving targets (par. 118). Stationary

targets may be panels or improvised log pill boxes.

**b. Conduct of exercises.** (1) Each member of the squad will be required to perform alternately the duties of squad leader and gunner in firing one exercise on a stationary target, and one on a moving target. It is essential that each member of the squad be able to perform the duties of squad leader and gunner efficiently. Those not engaged in serving the gun will observe the performance of the firing crew and will assist in the critique.

(2) In stationary target firing the instructor will indicate a target to the squad member, who will deliver his initial fire order and adjust by correct subsequent orders until an effective hit is obtained. The instructor will observe the performance closely and will correct improper commands, faulty orders, or gunners' faults as they occur. The squad must be impressed with the necessity for making each round effective.

(3) For initial moving-target exercises the instructor will require the squad member to deliver the correct initial and subsequent fire orders for adjustment as the target moves across the range. Later exercises will require the shifting of fire from one target to another, as they move across the range. A critique will be held at the end of each exercise.

### 133. SAFETY PRECAUTIONS. See section V, chapter 5.

## Section IV. COMBAT-RANGE FIRING

**134. GENERAL.** Combat-range firing is the phase of training which combines all the training previously discussed in this manual and is designed to require a demonstration of individual and crew proficiency in all phases. For this purpose the squad, under the command of the squad leader, is conducted through a series of exercises which as nearly as possible simulate

battlefield conditions. The situation for each exercise will be given by the instructor, who will be the exercise umpire; the squad leader will direct and control the squad in the actions required; and at its completion the exercise will be critiqued by the instructor.

**135. EXERCISES.** The instructor should vary the exercise situations and terrain as much as possible, so that the squad will not be presented with the same situation twice. The exercises following are given as a guide for the instructor.

**a. No. 1.** (1) The squad is brought to the position area on its prime mover. The instructor indicates the general direction of a possible approaching tank attack or a stationary target, and the position area for the gun.

(2) The squad is required to unload the prime mover and go into action immediately.

(3) When the gun is prepared for firing, the instructor causes the target to appear.

(4) After the firing is completed, a critique is held to discuss the execution of the exercise by the squad. Speed and teamwork in preparing the gun for action, service of the piece, and conduct of fire are stressed.

**b. No. 2.** (1) The gun is placed in its firing position with the carriage and bore pointing in a direction which will require the trails to be shifted after the first round in order to continue tracking a moving target.

(2) With the squad in firing position, the moving target is released. No. 1 calls out when the limit of traverse is reached; at the squad leader's command trails are shifted and the firing continued.

(3) A critique is held as before, covering the performance of each member of the crew. The importance of suspending fire for as short a time as possible is emphasized.

**c. No. 3.** (1) A situation is presented which requires the squad to move by hand for a distance of 25 to 50



yards to an indicated firing position and engage a target. (If the target is a moving one, it is released when the gun is prepared for firing.)

(2) The critique emphasizes speed of going into action.

**d. No. 4.** The squad (with prime mover and gun) is halted in a defiladed area, about 100 yards in rear of the firing position area. The squad leader is brought forward to the firing position area where he is instructed to place his gun in action to meet an impending attack; the direction of the attack is indicated by the instructor. The necessity for immediate reconnaissance of the position area by the squad leader while the gun crew unloads and moves the gun forward by hand, is emphasized in the critique.

**e. No. 5.** The squad leader is presented with a situation which requires the squad to prepare a firing position and a cover position. A time limit for preparing the positions is given. The gun is placed in the cover position fully prepared for action. While work is progressing on the cover position, an indication of a tank attack requires the crew to push the gun into the firing position and engage the target. The target appears when the firing position is occupied and the gun is ready for firing. Continuous observation of the sector during preparation of the positions and the importance of camouflage, cover and concealment in both positions are emphasized.

**f. No. 6.** Same requirement as in exercise No. 5 except that the firing position area affords "scant cover" and the gun must be moved by hand (trails closed) a considerable distance.

**g. No. 7.** The platoon leader is brought forward and assigned a firing position area and a sector of fire for the platoon. He is told there is a threat of a tank attack from a specified direction which may come in the next 10 or 15 minutes. This situation requires the selection of positions by the platoon leader, preparation and occupation of a firing position by each squad,

and orders of the squad leader to engage a target. The time allowed before the target appears is about 15 minutes. While work is progressing, the target appears. The importance of advance reconnaissance by leaders of firing position areas and gun positions, necessity for continuous battlefield observation, and readiness to engage a target, are discussed in the critique.

## Section V. CONDUCT OF COMBAT-RANGE FIRING

**136. COMBAT RANGE. a. Range.** This range provides four moving-target courses. Details of construction are found in TM 9-855. Two courses run parallel to the front of the firing line at ranges of 400 and 600 yards, respectively. Two courses offer various directions of movement approaching and receding from the gun. As in previous exercises, target speeds should start at 5 miles per hour and gradually increase to 15 miles per hour or greater. Stationary targets, such as *A* and *B*, are placed at varied ranges as required by the exercises given. Vertical profile targets may be tank size, and targets with little or no vertical profile may be improvised log pill boxes or panels placed flat on the ground.

**b. Operation.** (1) When the operating personnel have been trained, an exercise may be fired every 6 to 8 minutes, provided two towing vehicles are used.

(2) The second vehicle, as soon as safety permits after each run, moves to the old target. The towrope is unhooked from the old target and fastened to a new one. The second truck then proceeds around the course in the reverse order while personnel following the truck engage the towrope over the successive pulleys. The target is returned to its starting position, the forward end of the towrope is attached to the towing vehicle, and the firing line is notified that the operating detail is ready.



(3) When available, two radio sets should be used for communication between the operating detail and the firing line. The set with the operating detail may be placed on the second vehicle, allowing continuous communication while replacing the target. This arrangement saves time and makes the system more flexible.

(4) The safety limits for all firing on the range are established to conform with AR 750-10.

**137. SAFETY PRECAUTIONS.** See section V, chapter 5.

## CHAPTER 7

### GUNNER'S PROFICIENCY TESTS

#### Section I. GENERAL

**138. PURPOSE.** The purpose of each test is to—

a. Provide a means of determining the relative proficiency of the individual soldier in the performance of his primary duties as gunner.

b. Provide the soldier with an incentive to excel in the performance of those duties. These tests will not be a basis for determining the relative proficiency of a unit.

**139. CLASSIFICATION.** Any officer, warrant officer, or soldier who completes the following tests in a satisfactory manner will be eligible to compete for the gunners classification.

**140. TESTING PERIODS.** All officers, warrant officers, and enlisted men of an organization whose primary weapon is the 57-mm gun M1, will be tested prior to firing the piece, and at such other times as are deemed necessary to maintain a high standard of proficiency in the individual.

**141. EXAMINING BOARDS.** Each examining board will consist of one or more officers and such enlisted assistants as are necessary. So far as practicable, the examining board for any particular organization will be made up of officers from other organizations. Boards will be appointed by the battalion (and similar unit) commander, for the examination of battalion personnel.

**142. CONDUCT OF EXAMINATIONS.** Examining boards will conduct examinations at the places and times directed by the appointing authority.

**143. RECORDS AND REPORTS.** *a.* A record will be made by the examining board of each individual tested, to include the credits earned on each test. Maximum total credit on all tests is 100. A total credit of 80 is considered satisfactory.

*b.* A report will be rendered to the convening authority by the examining board listing the names of all individuals tested. The report will include the total credits earned and will indicate those considered satisfactory.

## Section II. MATERIEL TESTS

**144. GENERAL.** The gunner will be required to perform the following prescribed tests. He will be told the nature of the test before he takes his post.

**145. DISASSEMBLY OF STRIKER (FIRING) CASE (ONE TRIAL).** *a.* The gunner takes his post. The examining officer commands: DISASSEMBLE STRIKER (FIRING) CASE. The gunner performs the operation as described in TM 9-303.

*b.* The gunner will be marked on the general merit of his work.

*c.* If the trial is correctly performed a credit of six points is given.

**146. ASSEMBLY OF STRIKER (FIRING) CASE (ONE TRIAL).** *a.* All parts of the disassembled striker (firing) case will be arranged in order convenient for the gunners use in assembly. The gunner takes post, and the examining officer commands: ASSEMBLE STRIKER (FIRING) CASE. The gunner performs the operation as prescribed in TM 9-303.

*b.* The gunner will be marked on the general merit of his work.

*c.* If the trial is correctly performed, a credit of six points will be given.

**147. LUBRICATION (ONE TRIAL).** *a.* The piece will be placed in action. A complete set of lubrication equipment and plainly labeled containers for every type of lubricant used on the piece will be made available. The gunner takes post, and the examining officer commands: DAILY LUBRICATION TEST. The gunner selects the proper lubricating devices and lubricants and shows how each place requiring daily lubrication is lubricated, but does not perform the actual lubrication.

*b.* For each place missed or improperly lubricated and for each time the proper lubricating device or proper lubricant is not selected, a 1/2-point penalty is assessed.

*c.* If the trial is correctly performed, a credit of eight points will be given.

**148. BORESIGHTING WITHOUT TESTING TARGET (FOUR TRIALS).** *a.* The piece will be placed in action pointing generally in the direction of several objects at a distance of at least 1,500 yards. The telescope will be placed out of adjustment for deflection and range. The gunner takes post and the examining officer commands: BORESIGHT WITHOUT TESTING TARGET. The gunner places improvised cross hairs on the muzzle of the piece, removes the striker (firing) case, centers the cross hairs on the distant object, and adjusts the telescope by the prescribed method.

*b.* No credit will be given if the object selected is less than 1,500 yards distance from the piece, or if the center of the telescope and the center of the bore are not aligned on the object.

*c.* For each trial correctly performed, a credit of five points will be given.

**Section III. DIRECT LAYING TESTS**

**149. GENERAL.** Place stationary targets at ranges between 500 and 1,200 yards. Moving targets will move at ranges less than 800 yards. The piece is placed in action. The examining officer checks the laying for range and deflection after each trial. He allows no credit if laying is not precisely correct.

**150. STATIONARY TARGETS (FOUR TRIALS).** *a.* The gunner takes post. The examining officer transmits an appropriate fire order; for example —

LEFT FRONT  
PILL BOX BETWEEN TWO TALL TREES  
ONE THOUSAND  
ZERO LEAD  
COMMENCE FIRING

*b.* At the command COMMENCE FIRING, the gunner lays the piece, calls, "Ready" and moves his head clear of the telescope.

*c.* For each trial a credit of five points will be given only if the telescope is accurately aligned.

**151. SETTING LEADS (FOUR TRIALS).** *a.* The gunner takes post and the examining officer transmits an appropriate fire order; for example —

RIGHT FRONT  
TANK  
SIX HUNDRED  
ONE LEAD  
COMMENCE FIRING

*b.* At the command COMMENCE FIRING, the gunner lays the piece, calls, "Ready" and moves his head clear of the telescope.

*c.* For each trial a credit of five points will be given only if the telescope is aligned correctly as to range and lead.

**152. TRACKING MOVING TARGETS (FOUR TRIALS).** *a.* The gunner takes post. On signal from the examining

officer a vehicle starts across the line of observation. The examining officer gives the appropriate orders. At the command COMMENCE FIRING the gunner lays the prescribed range and lead and tracks the target. The examining officer checks the laying and tracking by one of the following methods:

(1) *With M18 telescope.* Use the aim checking device M1.

(2) *With M69C telescope.* The telescope must be offset prior to the test so that when the bore is pointed at the target the range and lead markings to be used by the gunner in the test are on the target also. This offset must be made prior to the beginning of the test. The examining officer can check the laying and tracking by looking through the bore, using for sights improvised vertical and horizontal cross hairs on the muzzle.

*b.* For each trial, a credit of five points will be given if the correct lead and elevation are smoothly maintained.

## CHAPTER 8

## ADVICE TO INSTRUCTORS

## Section I. GENERAL

**153. PURPOSE.** The purpose of this chapter is to aid the instructor in presenting the instruction necessary to the successful training of antitank units. In conducting gunnery training, it is necessary that the instructor follow methods of training prescribed in FM 21-5.

**154. TRAINING AIDS.** For the convenience of the instructor, training aids which can be prepared easily and which pertain to the material of this text are listed below:

- a. Cut-away model of the recoil mechanism.
- b. Blackboard picture of the telescope reticle.
- c. Working model of the semiautomatic gear mechanism.
- d. Charts outlining phases of instruction.
- e. Diagrams of specific points of instruction.

## Section II. CONDUCT OF INSTRUCTION

**155. MECHANICAL TRAINING.** Instruction in mechanical training lends itself readily to the use of the applicatory method of instruction. The unit should be divided into squads. Each squad is assembled at the place of instruction with its own gun and set of equipment under the direction of an assistant instructor. The principal instructor, after explaining each phase, should allow periods of practical work on that phase

under the direction of the assistant instructor.

**156. CREW DRILL.** When giving instruction in elementary crew drill, demonstrations by a trained demonstration unit should be used. Demonstration teams can be trained to perform accurately in approximately 5 or 6 days. After explanation of the drill by the instructor and demonstration by the team, squads should be moved to the guns for periods of practical work. Initially, each drill movement is executed, slowly step-by-step, until the assistant instructor in charge of each gun is satisfied with the performance of each man. To avoid monotony in periods of drill instruction, games and quickening exercises should be interspersed throughout training. Speed competitions should be used only when squads have acquired precision in each drill movement. Each phase of advanced crew drill should be covered by a complete and thorough explanation and demonstration.

**157. LAYING THE GUN. a. General.** A conference in which the instructor explains fully the telescope reticle should be the first phase of instruction in laying the gun. The conference should follow the sequence in the manual. A practical work period should follow during which the same sequence is followed. The instructor issues fire orders and the gunners set sight pictures on stationary targets. Tracking and simulated firing follow, with emphasis on the correct gunner's position for tracking a moving target. Frequent rotation of duties within each group, with each man performing each phase of an exercise several times, is preferable to keeping one man at one position a long period of time.

**b. Instructional aid (fig. 33).** A transparent diagram of the telescope reticle will be useful to the instructor in laying the gun and in subcaliber firing. The telescope reticle diagram or overlay is placed on a rectangular sheet of transparent plastic or other similar



transparent material. The material should be fairly rigid so that it will maintain its shape without wrinkling or warping. If it is necessary to use thin sheets, they may be framed. An enlarged copy of the telescope reticle is painted black on the sheet of plastic with the horizontal lead-lines along the longer axis of the rectangle. A coat of thin shellac will fix the painted diagram to the smooth surface of the plastic.

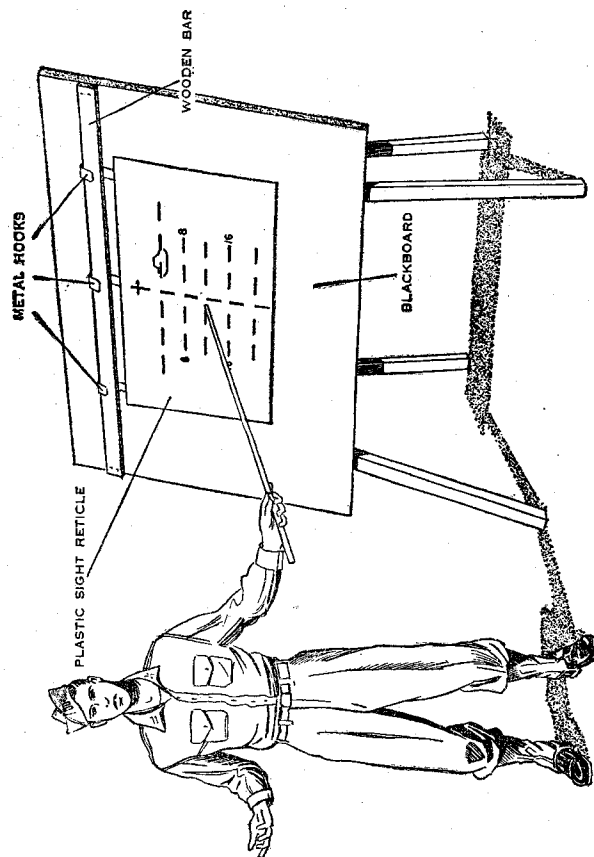


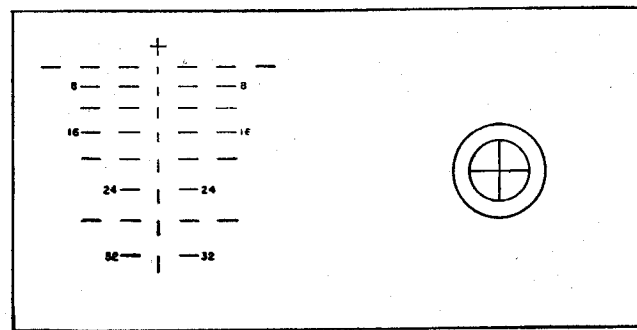
Figure 33. Use of transparent reticle.

**158. GUNNER TRAINER. a. General.** The gunner trainer is a training aid useful in teaching the use of the sight reticle, sight adjustment, leads, and fire adjustment.

**b. Description and construction (fig. 34).** The gunner trainer consists of —

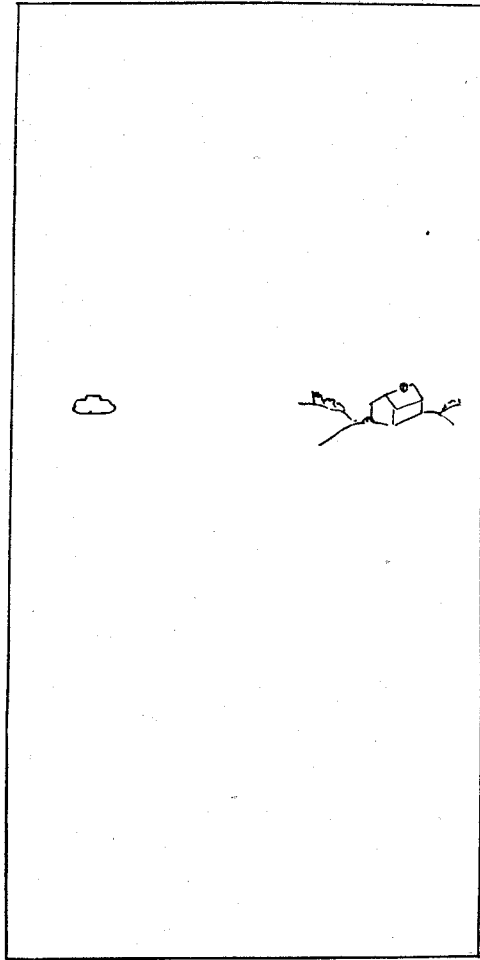
(1) A paddle (fig. 34①) made of transparent material on which is inscribed a sight reticle and a circle with cross hairs to represent a muzzle bore sight. A convenient size is  $11\frac{1}{2}$  inches by 3 inches.

(2) A target board (fig. 34②) on which is drawn a tank silhouette and an object suitable for use as a distant aiming point. The tank silhouette should be about 8 mils in length measured on the sight reticle of the paddle. A convenient size for the target board is 2 inches by 4 inches. It should be covered with transparent material fastened at the top and bottom but with sides open to permit insertion of the paddle.



① Paddle.

Figure 34. Gunner trainer.



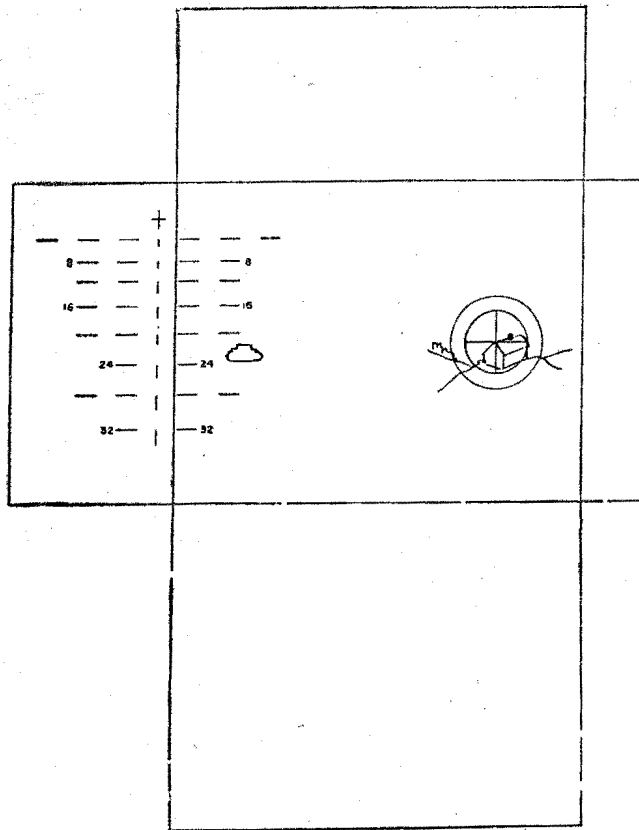
② Target.

Figure 35. Gunner trainer—Continued.

**c. Use.** (1) To teach boresighting, require the gunner to place the paddle over the target and move it until the muzzle cross hairs are on the aiming point (fig. 35 ①). Next have him move the paddle until the sight reticle is properly on the aiming point (fig. 35 ②). Have him explain the steps.

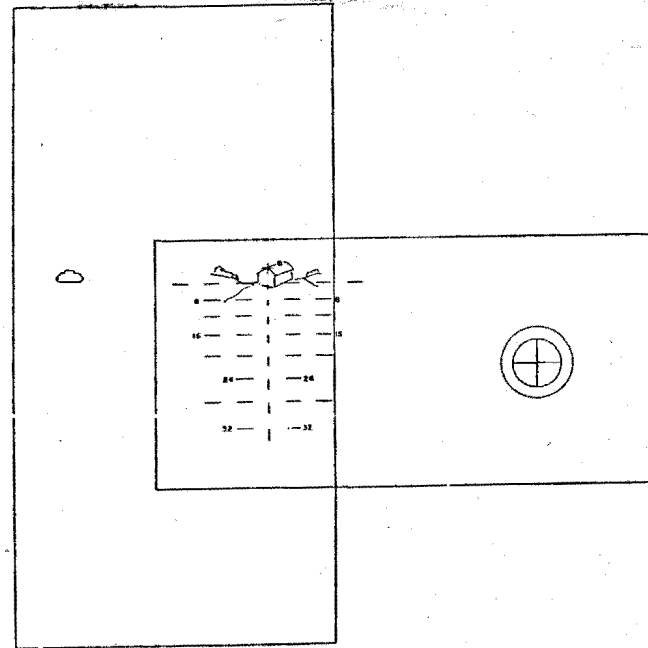
(2) To teach leads, announce a range and lead. Cause the gunner to move the paddle until the sight reticle is on the silhouette tank with the announced range and lead.

(3) To teach fire adjustment, place the gun commander about 20 or 25 feet from a terrain board. Point out a target and have the gun commander give a fire order. The gunner, using the silhouette tank as a target, moves the paddle until the sight reticle is on the tank silhouette with the range and lead, if lead is given, as announced by the gun commander. He then commands: FIRE. The instructor then indicates the point of impact by pointing to a spot on the terrain board near the previously designated target. The gun commander, using field glasses, measures the lateral deviation of the round from the target, estimates the range, and gives a subsequent fire order. The gunner should be checked for correct sighting. Each problem should be critiqued.



① Muzzle boresight on aiming point.

Figure 35. Use of gunner trainer in boresighting.



② Sight reticle on target.

Figure 35. Use of gunner trainer in boresighting--Continued.

**159. SUBCALIBER FIRING.** When firing on the sub-caliber range is contemplated a sufficient number of targets should be prepared well in advance. The necessity for other equipment and spare parts should be anticipated so that firing need not be stopped because of failure to anticipate needs.

a. The following is a check list of equipment necessary for training on the subcaliber range:

Target frames and different types of targets.

Target paste and paste brush.

Pasters (black and white).

Ammunition, caliber .22 and caliber .30.

Magazines, caliber .22.

Stop watches.

Pencils.

Progress chart.

Repair tools for guns and range.

b. Prior to day of firing the instructor should insure that —

(1) All range equipment and apparatus is in working order.

(2) Orders are ready for firing.

(3) A chart for recording scores is provided.

(4) Range is available and marked with safety flags.

c. The instructor should publish promptly the scores made during instruction and record practice to stimulate interest and arouse a spirit of competition.

**160. SERVICE FIRING CRITIQUE.** a. The basis of good instruction in these exercises is intelligent, tactful, and constructive criticism. The critique should constitute a discussion of each step in the solution of the requirements. It should be given on the ground used for the exercise immediately after the conclusion of the exercise.

b. The officer conducting the critique should commend that which was well done and call attention to that which was poorly or incorrectly done. In making corrections, the instructor should avoid ridicule,

sarcasm, or any remarks which might be harmful to morale or initiative.

c. He must be careful not to base his judgment of execution of the exercise too much on results of the firing. The proper use of terrain, camouflage, fire orders, fire discipline, and fire control must be given due consideration.



## APPENDIX

## LIST OF REFERENCES

Records and Reports of Qualification in Arms . . . . . (Sec. II, Cir. No. 265, W.D., 1943.)	
Range Regulations for Firing Ammunition for Training and Target Practice . . . . .	AR 750-10
Qualification in Arms and Ammunition Training Allowances . . . . .	AR 775-10
Military Training . . . . .	FM 21-5
Defense Against Chemical Attack . . . . .	FM 21-40
Infantry Drill Regulations . . . . .	FM 22-5
Motor Transport . . . . .	FM 25-10
Decontamination . . . . .	TM 3-220
57-mm Gun M1, and Gun Carriages M1, M1A1, M1A2, and M1A3 . . . . .	TM 9-303
Cleaning, Preserving, Lubricating, and Welding Materials and Similar Items Issued by the Ordnance Department . . . . .	TM 9-850
Targets, Target Materials, and Rifle Range Construction . . . . .	TM 9-855
Ammunition, General . . . . .	TM 9-1900

NOTE. A complete list of SNL's and other explanatory publications relative to the 57-mm gun M1 are contained in TM 9-303.

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